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CONTENTS

WE have had enough experience in the manufacture of cast steel to be able to tell pretty definitely the kind and quality of metal that is needed for various classes of work, and to be able to draw up rather close and reliable specifications as to chemical and physical properties and the tests to which the metal should be subjected. And this is exactly what was done by the committee on specifications for Freight Car Truck Sides and Bolsters. As to the tests for the complete truck side or bolster, the recommendations are tentative and are offered purely for the purpose of obtaining criticisms for future guidance. Probably the desired result will be obtained. In the case of the truck side the proof load will require a factor of safety of about four and for the bolsters about two, which is undoubtedly enough, though it is probable that very few bolsters will pass through a month's service without being subjected to stresses.

SEVERAL errors occurred in the report of the discussions which took place at Thursday's meeting. This was because of inaccuracies in the stenographer's transcript. Among the worst of these errors was one which credited a motion in connection with the coupler report to C. A. Schroyer, instead of to C. A. Seley. Those who are acquainted with Mr. Seley know that he has felt that the M. C. B. Association had made a serious mistake in making a standard of the top lift for couplers, and has used all his influence to change this standard to include a provision for the operation of the lock from the bottom. The motion to include in the standards the operation of the lock from the bottom as well as from the top should have been credited to Mr. Seley.

HAS the steel passenger car passed beyond the point of interest to an association like that of the Master Car Builders? A casual visitor to the exhibits or a regular attendant at the meetings might be inclined to think so. There is not a steel passenger car, or a major part of one, on exhibition, and the term was hardly heard in either the reports or discussions. Only a few years ago there was an extensive exhibit of steel cars, and the features of design and repair frequently came up at the meetings. That there has been wonderful progress in the development of this class of equipment is admitted, but to assume that all the problems have been solved would be a big mistake. There are now nearly as many different designs of steel passenger cars as there are roads using them. It may be that they are all satisfactory, but it is doubtful if there are not features of some which are better than those on others. Where are these problems to be threshed out if not at the meetings of the Master Car Builders' Association?

IT IS useless to expect results from a car department apprenticeship course if the boys are not paid a journeyman's rate when they are graduated. The average boy, after he has served a four years' apprenticeship in the car department and has received a reasonable amount of attention from his instructors and foremen, where a good apprenticeship system is in effect, should be in position to give better service to the company than the average mechanic who has not had such a training. If so, why not pay him the same rate? We like the attitude of one master car builder who absolutely insists that the graduate apprentices be given this sort of treatment. If a boy is not worth a journeyman's wage at the end of four years of apprenticeship, it is either because he is not suited to the work or the railway has not done its duty in training him. If not adapted for the work he should have been dropped or transferred within a few months of the time he entered the service, to a department for which he was better suited. As far as the railway performing its duty in training the boys is concerned, it must do it, or the shortage of good men in the car department, which was so forcibly commented on at last year's convention, will become still more serious.

IN the convention yesterday C. B. Young, of the Pennsylvania, called attention to the fact that THE DAILY yesterday morning published an editorial entitled "Freight Car Trucks," which discussed the report of the committee on Specifications for Tests of Steel Truck Sides and Bolsters before that report had been presented to the M. C. B. Association. On his motion the matter was referred to the executive committee. We hasten to admit the entire justice of Mr. Young's criticism, and to make apology to the association for the error—for error it was. The editorial in question was intended for publication this morning along with the abstract and the report, and not yesterday morning. It has always been the consistent practice of this paper to keep inviolate the confidence of the mechanical as well as all other associations. We fully recognize the fact that it is not only

the right and even the duty to insist on this course being followed by all publications which they honor by entrusting to them advance copies of their reports, and we give the most explicit assurance that only one of those mistakes which are apt to happen even in the best of regulated newspaper families caused this apparent indiscretion.

DURING the "free for all" discussion that filled the interval before the tellers made their report, several very valuable suggestions were made. Mr. Young advanced the idea of having a committee appointed to rewrite the specifications of the association and bring them to a uniform condition of statement and arrangement. Anyone having to use or refer to these specifications will fully appreciate the importance of this idea. The American Society for Testing Materials has had a committee of this kind at work for some time and it was probably the noticeable effect of its work that led to this suggestion. It is to be hoped the executive committee will appoint such a committee and that it will get at its work promptly. Slower speed of freight trains during protracted and severe winter weather, as suggested by Mr. MacBain, will no doubt have a beneficial result on the extremely large number of loose and lost nuts on truck bolts, slid-flat wheels, broken brake beam hangers, etc. Even with slower speed, conditions are frequently so severe as to make it seem impossible to provide a construction that will successfully stand the test. One member mentioned track where one rail was 11 in. out of surface. Under such conditions, even at the slowest speed, the car and trucks receive very severe punishment. Reference to the "stitch in time" is heard so frequently that it does not have the effect it should have. In spite of its repetition the statement of Mr. Brazier hits at the very heart of most of the trouble and expense of both car and locomotive maintenance. Spend $1.50 when it is needed and prevent the necessity of spending $500 in the very near future.

CAR DEPARTMENT APPRENTICESHIP

THE discussion on Mr. Downing's paper on apprenticeship was a distinct disappointment. This is such a tremendously big subject, and there is so much to be said of a serious nature that it is unfortunate that the meeting developed into a series of reminiscences, mostly related to what happened from 25 to 40 years ago. Everybody knows that the car department is confronted with a serious problem because of the shortage of young men who have a thorough knowledge of the business, and nobody will dispute the fact that conditions have become so changed in the past few years that the matter must be approached by radically different methods from those previously followed. There were men in the convention hall who have gained results in the developing of apprentices along the right lines; it is too bad more of them did not participate in the discussions.

There were two bright spots in the discussion. One was when J. J. Hennessey emphatically said that if the railways hoped to get the right kind of young men into the car department they must not only put them on the same basis as the motive power apprentices, as far as remuneration is concerned, but that they must pay them as well after graduation. The other was when M. K. Barnum said that car department apprentices must have a general training and should be transferred from one class of work to another according to a regular schedule, which they would thoroughly understand before they entered the service. This schedule should cover all the more important parts of the work from the repairing of freight cars to such cabinet work as the skill of the individual apprentice will permit. Mr. Downing is undoubtedly right in believing that the best results can hardly be obtained by having a number of highly specialized apprentice courses in the car department and Mr. Barnum's conclusion is the reasonable one.

What is really needed now is action—and quick action. There has been plenty of talk, almost too much. The suggestions made by Messrs. Hennessey and Barnum are logical and will give results for they have been tried out either in whole or in part and are giving good results.

THE FORTY-SIXTH CONVENTION

"A GOOD record of conservative progress." This is the way in which one of the members summed up the forty-sixth annual convention of the Master Car Builders' Association at its close yesterday. The meetings were largely attended; at times the meeting hall was not nearly large enough. Those in attendance seemed to follow both the reading of the papers and the discussions closely, although the latter were possibly not as lively and spicy as many of them have been in the past. In most cases, however, they were right to the point.

Usually the reports or the discussions of some one or two subjects seem to overtop all of the others. Possibly the two subjects which received the most attention at this convention were those on Overhead Inspection of Box Cars and Car Trucks. One paper which many of the members thought would receive more than its share of the discussion received practically none. This was the coupler report. It was necessarily only a report of progress and represents an enormous amount of work on the part of the committee. The problem of adopting a standard coupler will undoubtedly prove one of the hardest tasks the association has ever set itself to perform and possibly the lack of discussion was largely due to the fact that the members generally felt that the committee in charge and the executive committee were on the right track, and with another year's work on the problem would be in position to determine how the problem might best be solved.

The report on Overhead Inspection of Box Cars was one of three reports made by the same committee. The committee on Rules for Loading Materials which had it in charge was also asked to investigate and report on the Damage to Freight Equipment by Unloading Machines. The report on Overhead Inspection was inspired by a meeting between the executive committee of the Association and a committee of the American Railway Association last December. The members generally were not aware that such a report was to be made, but that they have been giving the matter of defective box cars more or less thought and study was indicated by the way in which they took part in the discussion. No question was raised as to the seriousness of the situation, but there was a difference of opinion as to how it should be remedied. On the one hand some of the members felt that it would be an admission of negligence on their part to admit to the railway managers that the equipment was in the condition it was, but that they should set about to remedy it in their own way. Others believed that the matter should be referred to the American Railway Association in order that the car department heads may receive the proper authority and support to go ahead and put the equipment in first-class condition. It will require large expenditures to do this, but after it is once done, the cars can be maintained in good shape.

Time and time again the matter of poor freight car trucks and the resulting derailments and accidents come up, and it is apparent that this matter must also receive prompt and effective treatment without delay.

It was expected that the report on Car Department Apprenticeship would also be thoroughly discussed and while the discussion did occupy a considerable amount of time it was not, with one or two exceptions, to the point.

On the whole the convention will pass down in history as one of the most successful that has ever been held. The association is awake to the importance of its work and the possibilities that lie before it. The spirit of the convention indicated that the members intend to use their best efforts to bring about a thorough and satisfactory solution of the important problem with which they are confronted.

Announcements.

TO-DAY'S AND SUNDAY'S PROGRAMS.

SATURDAY.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Base Ball Parade 2.00 P. M.—Million Dollar Pier to special trolley cars.

Base Ball Game, 3.00 P. M.—East v. West, Pennsylvania Railroad Company's Inlet Park Base Ball Grounds. Free trolley cars for those wearing the official badge.

SUNDAY.

Concert 11.00 A. M.—Marlborough-Blenheim Hotel Orchestra, Leo Sachs, musical director: Largo (*Handel*); Two Intermezzi from the Opera, The Jewels of the Madonna (*Wolf-Ferrari*); Andante Cantibille from the String Quartet (*Tschaikowski*); Serenade (*Drdla*); Suite (*Kate Vannah*); (a) Dawn (b) Sleepy Baby; Fantasie, La Boheme (*Buccini*), Violin Solo; Andante from the Concerto (*Bruch*), Michael Benner; Ave Maria (*Gounod*).

Concert, 8.45 P. M.—Overture, Tannhauser (*Wagner*) Violin Solo; Faust Fantasie (*Wieniwski*), Michael Benner; Fantasie Samson et Delila (*Saint-Saens*), Cello Solo; Tartantalla (*Popper*), Leo Sachs; The Lost Hope (*Gottschalk*), Piano Solo; Polonais (*Liszt*), Henry Gruhler; Hungarian Rhapsody (*Liszt*).

WHERE TO DO YOUR CLEANING.

Exhibitors will please assist the committee in charge by insisting that their janitors clean cuspidors at the ocean end of the pier, not in the aisles or vicinity of the boardwalk.

FOUND.

One large coat button and one brass key. Call at office of Secretary Conway .

CORNELL DINNER.

The seventh annual dinner of Cornell men attending the conventions will be held at the Hotel Chelsea on Saturday evening at 7.30. All Cornell men are requested to leave a note on Mr. Averill's desk in the booth of the RAILWAY AGE GAZETTE, before 3 P. M. stating that they will be present. The dinner will cost $5.00 a plate.

ENROLLMENT.

The booth for the registration of members and guests of the Master Mechanics' Association will be open at 8.00 o'clock tonight. No charge will be made for badges.

MUSICAL ENTERTAINMENT.

A musical entertainment was given on the Million Dollar Pier last night by the La Favorita Quartette, composed of Katherine Rosencranz, Julia Z. Robinson, Henry Hotz and Anthony D. McNichol, and by Ray Goldsmith and William H. Gwinnutt, vocal soloists; Joseph Cervantes, W. Boecklin, xylophonist, and Eugene Engel's orchestra. Following the programme by the regular entertainers William H. Gwinnutt led the crowd in singing "My Old Kentucky Home," "I Want a Girl," "Put On Your Old Gray Bonnet," "Auld Lang Syne," "In the Good Old Summer Time" and "America."

The committee in charge of the entertainment was composed of Leonard J. Hibbard, chairman; H. E. Oesterreich, E. S. Toothe, Thomas Farmer, Jr., William Miller, L. B. Sherman and T. W. Illingworth.

Proceedings.

President Stewart called the meeting to order at 9.45 Firday morning.

CAR SHOP APPRENTICES.

BY I. S. DOWNING, Master Car Builder, L. S. & M. S.

The recruiting of workmen in the car department has not been given the consideration in the past that it should. The apprentice system is a very good plan if we could get the boy to enter the car department, but in order to get the boys to take up car-department work we must be able to show them some inducement, either in mechanics' rates of pay or a line of promotion. There is no real reason why we should not be able to establish rates which would be sufficient to induce the boys to take up car-department work, without filling their heads full of the idea that some day they will be general manager or superintendent of motive power.

The trades we teach the boys are generally not trades that can be applied generally, and for that reason we should classify them railroad trades. The upholsterer trade in car shops consists of upholstering seat backs and cushions and the tieing of a few mattresses. Tufted work is seldom, if ever, done. What can the apprentice do after he has learned this trade in a railway shop? He con only follow upholstering in railway shops; if he goes to furniture factories or any other commercial concern he will have to learn the trade over. The above is also true of the tinners' trade. Railways purchase practically all tinware, and steel cars have eliminated a great deal of the tinners' work.

The painters' trade is taught more thoroughly, but the work is specialized, and I have known men to do nothing but varnish for 10 years. With reference to cabinetmakers—it is my opinion that the steel car will eliminate the cabinetmakers and carpenters entirely. These 2 trades were the most important trades in the car department and required a great many years to learn. With conversion from wood to steel, the work in these departments will be less complicated, the finish and other parts being machine work and will be ready to apply when received in the shop. Very little time will be required to teach the men how to remove and apply the various steel parts. It will necessarily follow that the cabinetmaker and carpenter will be converted into steel-car men.

It must be admitted that the car department has not the technically trained men that other departments have, and that the car-department salaries are not as attractive as the other departments. It must be admitted by car-department heads that the locomotive department requires more men with technical knowledge than the car department. This is true at least so far as shops are concerned, but I will not admit that there is more executive ability required to manage the locomotive department than the car department. The head of the car-department to-day is an operating officer as well as a car builder; he comes in contact with shippers and other railway officials and coöperates with officials in all departments on his own line. This the locomotive man does not do, except with his own line. A narrow-gaged car man can lose more business in one day than the freight department could solicit in a month.

I do not agree with car-department men that the line of promotion for the head of the car-department should be to superintendent of motive power. It is true some car-department men have been promoted to that position and have been successful; however, it was not due to the car-department training. I will also have to disagree with car-department men that the two departments should be separated, the car department being on an equal basis with the head of the locomotive department. There is too much in common with both departments to separate, and they should be under one head. It would be very encouraging to car-department men if they were considered for promotion through the transportation department. There is no reason why a division general foreman or general car inspector would not be able to fill the position of trainmaster and the master car builder as assistant superintendent, and if he knew his line of promotion was in that direction it would not be difficult for him to fit himself for that line of work, as he follows the operation of trains the same as the trainmaster. We need trained men for what we have to do, and the apprenticeship system is as good a recruiting scheme as I could suggest to supply the shop with trained workmen, but with the inducements we have to offer we do not seem to be able to get the boys—they want to go into the locomotive department, and we get what is left.

In view of the facts stated, relative to the different trades, remuneration and the absence of line of promotion higher than

the head of the car department, it is a question, unless some radical changes are made, whether the recruiting of workmen through the apprentice system is superior to the old helper system.

The accompanying illustrations give as an example of the kind of work the car apprentices of the New York Central Lines are given in their course. The paper closes by giving typical examples of the miscellaneous home problems.

The following is an example of these home problems:

1. A load of lumber consists of 1¼-in. boards, 12 in. wide and 16 ft. long, placed edge to edge. How many feet does the load contain if it is 36 in. wide and 30 in. high?

2. A carload of lumber consists of three tiers of 2½-in. planks. The tiers are 12 ft. long, 8 ft. 2 in. wide and 8 ft. 4 in. high. How many feet does the car contain if we deduct 2 in. from the width of each layer for cracks between the edges of the planks?

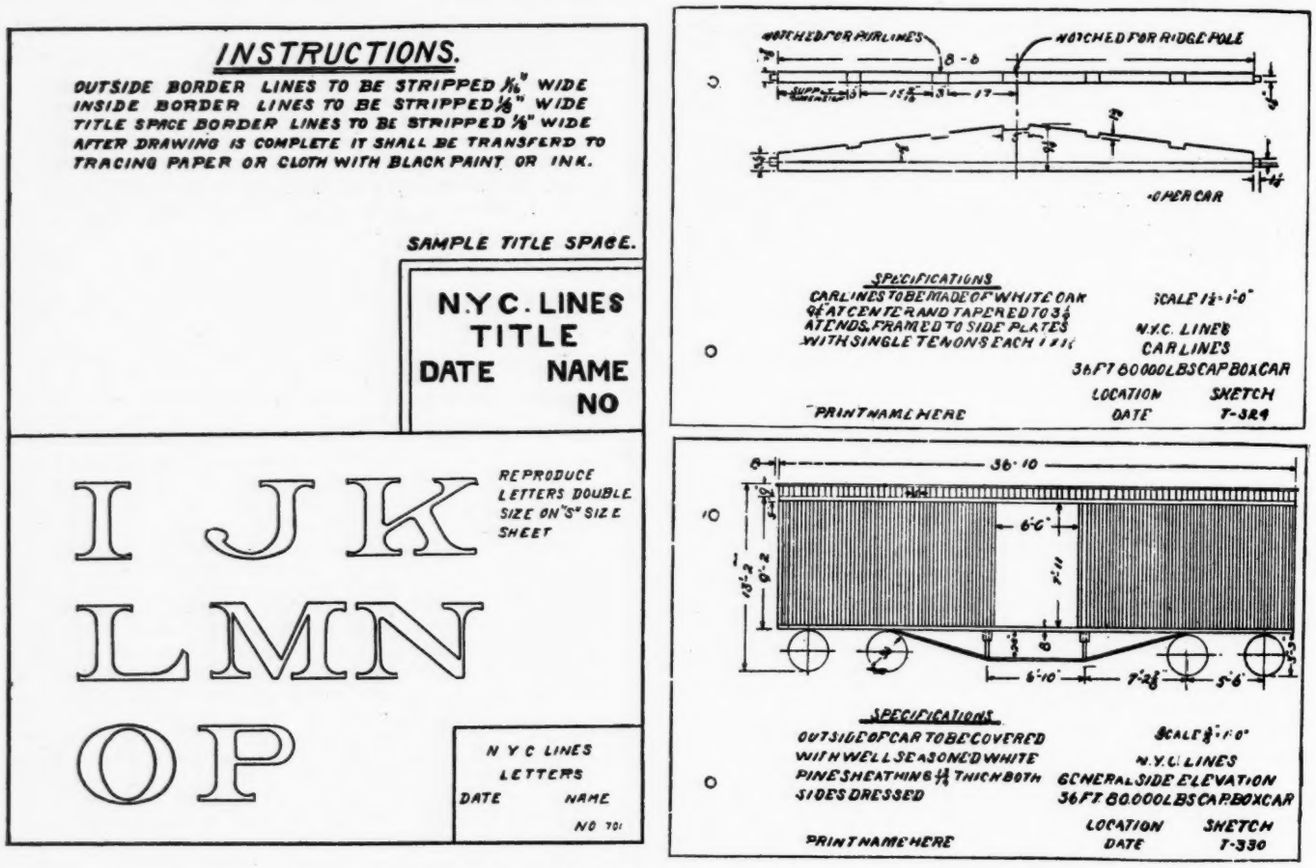
3. A stack of 1¼-in. boards is 16 ft. long, 12 ft. wide and 13 ft. 6 in. high. To allow for seasoning, each layer of boards is separated from the other below and from the ground by 3 pieces, each 1 in. by 6 in. by 12 ft. long (one at either end and one in the middle running crosswise of the stack). It we deduct 3 in. from the width of the stack for cracks between the edges of the board and count in the cross pieces, how many feet does the stack contain? (Make sketch.)

4. How many feet would there be in the stack in Problem 3 if the boards were 1 in. thick and the cross pieces 4 in. instead of 6 in. wide?

5. Find the cost of material for seventy-two tool racks, each requiring the following stock:

1 piece 2 in. by 2 in. by 15 in., white wood at $70 per M.
1 piece ⅝ in. by 4 in. by 15 in., white wood, at $60 per M.
3 flat-head screws, 1¼, No. 7, at 20 cents per gross.

6. How many feet of lumber will be required to floor a platform 16 ft. 4 in. long by 11 ft. 6 in. wide, the lumber to be 1 in. thick and no allowance is made for waste (nearest foot)?



Examples of Work Given to the Apprentices of the New York Central.

DISCUSSION.

F. W. Brazier (N. Y. C. Lines): As a car man 38 years in the service I have got to a point where I suppose they will think I am too old to be good for much, and will be laid on the shelf. In saying this I have no motive in what I am going to say, but say it from the heart. I want to say that anything I say is simply my opinion coming from my heart; but I have a motive, to talk to the young rising men in this convention, representing I don't care whether it is the car department or the motive department. I want to say the car department is the department of the future. The present steam motive power men will be laid on the shelf in 10 years from now, and the car department men will be on top, because the motive power in 10 years from now will be electric; you will have just as much chance of going into the motive department as the steam men have to-day. So that there is a bright future for the car department men.

I wish to say that in my opinion the paper is well written, but there are some things stated in the paper with which I do not agree—I do not agree in the opinions advanced by the writer. First, I do not believe in having the car department under the same heads as the locomotive department I believe in having the car department under the supervision of the general manager. The car department represents the expenditure of more money than the locomotive department does. The road with which I am connected spends more than $12,000,000 annually in the car department against $8,000,000 in the locomotive department. In my opinion there is not care enough given to the selection of men for positions in the car department. The old way of thinking that almost anyone was good enough for the car department has gone by. The man who has charge of the car department is the man who spends the money. Each day a car foreman can either waste more, or save more than his salary, and it was with a great deal of feeling of regret that sometimes when we tried in days gone by to get a man's pay raised from $75 to $90 a month, a man who is annually handling material representing $400,000 to $500,000 a year, that our efforts to secure such an increase in his pay were unsuccessful; whereas, a master mechanic would be paid $200 a month, and have a small number of men under him and only a little to do, compared to the car foreman only to keep his engines running. I have a warm spot in my heart for the locomotive men, and think that many of them have a harder job than the men in the car department. The engine is the important thing in the operation of a railway. I do not believe we can fully appreciate the troubles and trials that the average enginehouse foreman

has to contend with. We know it is a hard job, and I am not saying anything against that.

I do not agree with the writer about the car department apprentices not having as good an opportunity for advancement as the apprentices in the motive power department. In my opinion, the apprentices in the car department have fully as good opportunity for advancement, and in some cases even better opportunity for advancement, as those in the motive power department have. In the car department the apprentices are worked through the dfferent grades; in any well organized system this should be done. It is true that an upholsterer in the car department may upholster seats and car backs, and would not have the ability to go into a high art building and upholster some of the fine decorations, the fine decorations in such a building, but if he has the stuff in him he will get ahead. We all know it is true in the erection of a building the mason puts the foundation in, the carpenters put up the building and the painters paint it, and the plumbers do their part. The work of mechanics is specialized in all the trades of life, whether in the railway or any other trade. We know that the motive power man turns and fits the wheels, but many of them could not adjust a side rod or tell how many tubes there are in a boiler.

I am a motive power man, in a sense. I served my time as an apprentice in a motive power department, but I finally entered the car department, I am proud to say, at 20 cents an hour, and have risen from the ranks to my present position.

In those days they did not select their car department men from the plan from which we have to select such men to-day, but in those days they selected men who had tools and served their time as apprentices. There are men in this room who came up the same as I did, and who learned his trade thoroughly in a car department. I feel that if I can say anything to encourage the younger element here I want to do it.

Furthermore, I feel proud of this badge which I wear as a past-president of this Association, and I thank the members of this organization for having made me eligible to wear it. I am also proud to sit up here in this front seat with these old veterans of the car department.

(Mr. Brazier closed his remarks with a poem of tribute to the Master Car Builder.)

C. A. Schroyer (C. & N.): I am very glad to hear Mr. Brazier make that address, and I think it is to be regretted that there are not more of our American boys that enter our car departments of railways. The work of the car department on railways to-day, because of the skillful manner in which it has been managed by the superintendents of the car departments and car builders, has become more of a specialized work than a general work, and the boy who enters the car department as an apprentice to-day will ordinarily stay on the repairing of trucks or the repairing of platforms or the repairing of roofs, or something else; and unless we take that boy in as an apprentice with the understanding that he is to be given a general knowledge of all the departments of the work we will never be able to educate our boys for future heads of car departments.

It is up to us to go into the high-ways and by-ways to get the boys by offering them inducements to come in. The inducement is not necessarily one of compensation; it is a prospect of what may come later. I know there are brains enough in the car department to-day to get to the upper levels, but when you get a good man in a place, you want to keep him there. But I really think to-day the trouble we have in the car department is due to the class of men we have to employ for that purpose; and the tendency of individual employment for individual jobs. Now, if a man goes to work on piecework, that man wants to do the kind of work that he can receive the most money for.

Another difficulty with our young men to-day, when they start out in life, is that they want to start at the top of the ladder at once. They want the best compensation, and they will take any class of work that will give them that compensation, and they will leave one class of work for another class of work where they can get 10 cents more for their work. Now, I know when I started out as a young boy, I started out at 18 cents a day and worked 10 hours a day. There are not many boys who will do that to-day. I left a position at $2.50 and took one at $1.50 after having served 5 years at cabinet making, during which time I had received not one cent for my labor. After getting $2 a day back in the seventies, I left the car department in which I was employed, and went into the Pennsylvania Company. In those days they would give you a chance, and they saw I had displayed an inclination to learn the work, and I had to, because I had a wife and baby; and I will say I never had a better place.

There is too great a tendency to-day to find out what pay you are going to get before you let them know what you are going to give them. That is one of the great drawbacks to-day; and it is not confined to the car department. It is confined more forcibly to many other departments of the railway; but I think if we will take an intelligent class of young men in the car departments and put them through all the departments and give them a general knowledge, we will have plenty of men to fall back on in our respective departments in the future.

John J. Tatum (B. & O.): I want first to emphasize the remarks of Mr. Brazier, that there is an opportunity in the car department for the young man. I started 33 years ago on the Baltimore & Ohio, and did my part at anything, as the boy says, helping to build grain elevators, helping to build locomotives, and then I went into the car department. The railway companies have made a mistake in placing me in the car department, because I have not been able to do enough for the young men. When you place a young man in the car department, he should be trained along up, so that he knows the value of a man's labor, knows what to expect of him and what he can do. We do not do that to-day, as we have years before. We start a man in the car department who goes along and earns the highest rate of salary that he can from the age he starts in; he starts in as a helper, and as soon as he can qualify himself for the best position, then he advances over the apprentice who starts in with his first, second, third and fourth year. We forget the apprentices very often and take the man who has not had the advantage of four years' apprenticeship. We should give the opportunity to a boy when he starts in with the shop as an apprentice, and do what we can to make him more eligible for a higher position.

H. LaRue (C. R. I. & P.): I want to say a word in regard to the remuneration for apprentices in the car department. I hardly think that the rules for the machinists, boilermakers and others should apply to the car department at the present time, with regards to the piece work system. I think the men, who in the future will be at the head of the car department, will be those men that have proven their ability while working piece work. I think a young man that can start in at the lowest grades of piece work and can demonstrate his ability to keep up his end, should be promoted to the extent of his ability. I believe that is part of the solution of our men for the car department. Of course, you will occasionally find one or more that will not take advantage of these conditions. I have found in the apprentice system in the car department, that after the boy has been there a short time, he wants to quit on account of poor pay.

J. F. DeVoy (C. M. & St. P.): The Chicago, Milwaukee & St. Paul do offer advantages to apprentices in the car department, and it appears to me unless this is carried out along the lines of both departments, there will not be any good come from the final results. For instance, a machinist in the car department must, to a certain extent, in the making of jigs and other things, be just as skillful as the man who fabricates in the steel line. An apprentice in blacksmithing must know far more than the man in the locomotive design, for the season that he must know how and have enough brains to make cut dies that will form different forgings quickly and cheaply. In the upholstering or in the inside trimming of the car we do not take the same amount of apprentices, but we do feel and give the same attention as we do in the other lines; and unless it is followed out, I don't think any good can come from the results to be obtained.

There never will come a time in this world when a car foreman will not be a man on whose shoulders there will rest greater responsibilities than on any man connected with the locomotive department.

I feel that I do know something about cars and that there is today not to exceed 25 good carmen in the United States who know all about it, and that is a matter which is to be very much regretted.

Referring to yesterday's discussion regarding the need of more money for the repairs of cars: We must have the necessary money to keep our equipment in proper order, but you must have men who can impress their superior officers and show them what is to be done.

J. J. Hennessey (C. M. & St. P.): The main question is: Why are we not getting more bright young men in the car department? What is the future for the apprentice? We might as well look the matter directly in the face. Very few carmen today would advise their sons to go in the car department. Why? Not that he considered the car department as inferior to any department in connection with the railway business, but there is not the same amount of money to be earned in the future in a

car department as in some other department. When a young man serves his time in a car department after spending some years as an apprentice, and in gaining knowledge of all the various branches of the department, his pay may be 30 or 32 cents an hour. If he serves his time in the locomotive department he is advanced at once to the position of a full machinist with a full machinist's pay of from 37 to 45 cents an hour. It can hardly be expected that we shall be able to get bright, intelligent young men to go into the car department and serve an apprenticeship in that department when he cannot see as good an opportunity for promotion as he can see in some of the other departments. The thing which must be done by the railway is to offer better inducements to the car apprentices than are offered in the other departments of the railway service, because to become a thorough car man, the apprentice must do a great deal more hard, disagreeable work; he has got to know how to be a car inspector, know how to repair his trucks, and go through the business from A to Z.

It has been my privilege to have had knowledge of the apprentice system for many years, in both the car department, the machinist department and also in the blacksmith shops, etc. I can turn a young man out of the blacksmith department, or the machinist department, after his regular time, having begun at the same time that the apprentice began in the car department, and this apprentice will be capable of going out and commanding a full day's salary. I ask if we would dare to put a young man, after four years' experience in the cabinet makers' trade, inside a sleeping car that costs anywhere from $18,000 to $25,000. There is not a man living who is a thorough car man, who can become a thorough car man in the same length of time that he can become efficient in any of the other departments.

M. K. Barnum (Ill. Cent.): I believe that there is a distinct field for a car department apprentice, but I do not believe that he should be either a cabinet maker's apprentice, a carpenter apprentice, a painter's apprentice, or an apprentice in the mill. I believe the apprentice should start in with the understanding at the start, between him and the management, that he will be given a chance to learn the business of the entire department, and I believe that a schedule should be arranged which he could look over before he starts work, and see what he is going to learn, see what opportunities he will be given, and that schedule should cover everything in the car department, all the more important parts of the work, from that of repairing a freight car truck putting in a brass, packing a box, up to such cabinet work as his skill and ability will enable him to do properly.

I do not agree with the writer of the paper that the cabinet work is going to be short lived in passenger cars. I believe that the ideal passenger car of the future will still have an interior finish of wood. One other suggestion of the writer of the paper appeals to me, and that is that the car department and the locomotive department should not be actually separated. I believe they should all be considered as part of the mechanical department. But I do believe that the organization of the car department should be given more prominence and that the salaries should be better than they have been in the past, and as to salaries, that matter is fast regulating itself, because the salaries have to be paid in order to get competent men. All who have had occasion to select men for the higher positions of car department work know that it is increasingly difficult to find men who are well qualified, as our friends, the supply men, are drawing so strongly on competent car department men and making their offers so attractive that the railways are being deprived of much of the talent that starts in their employ and shows capacity.

I am tempted to criticise one statement that Mr. Brazier made concerning the life of the steam locomotive. However, I do believe that the importance of electricity in the operation of railways is bound to increase rapidly.

Mr. Downing was given a vote of thanks for this paper.

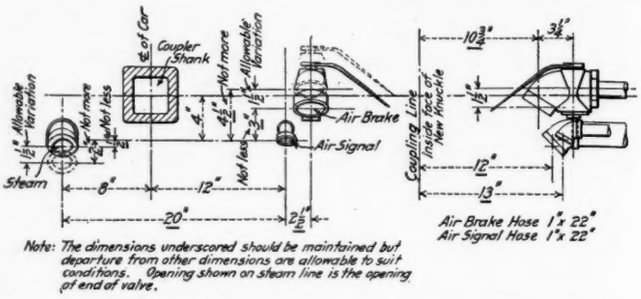
W. C. A. Henry (Penna Lines West): Mr. Crawford is not here this morning and I have been asked to withdraw his name as candidate for the presidency of this association. He is willing to allow his name to stand as a candidate for the vice-presidency.

TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.

In the 1911 report the committee recommended the following Recommended Practices be advanced to Standards: Two-inch train line; end steam valves, with not less than 1½-in. openings; location of steam, brake and signal pipe, as shown in Fig. 1.

Recommended for adoption as Recommended Practice: Nipple, as shown in Fig. 2; steam hose to be 5-ply, 1½ in. inside diameter and 25 in. long; hose clamp, as shown in Fig. 3; each end of hose to be fitted with nipple, as shown in Fig. 2 and coupler to have not less than 1½-in. opening. The horizontal elevation of nipple to opening through coupler is: minimum, 15 deg.; maximum, 20 deg.; coupler to be tapped with 1½-in. pipe thread. Couplers were considered, but no recommendations were made.

The committee sent out a circular of inquiry, under date of August 14, 1911, from which a number of replies were received, and from the data thus sent in and from investigations during



Note: The dimensions underscored should be maintained but departure from other dimensions are allowable to suit conditions. Opening shown on steam line is the opening at end of valve.

Fig. 1—Location of Steam, Brake and Signal Pipes Recommended for Standard.

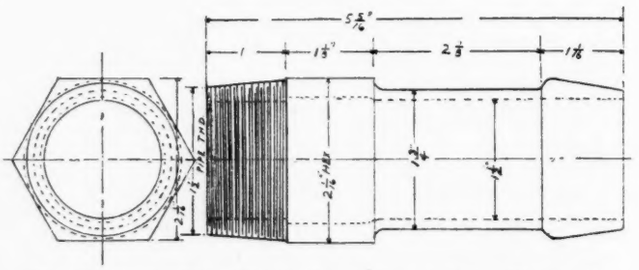


Fig. 2—Train Pipe Nipple Recommended for Standard.

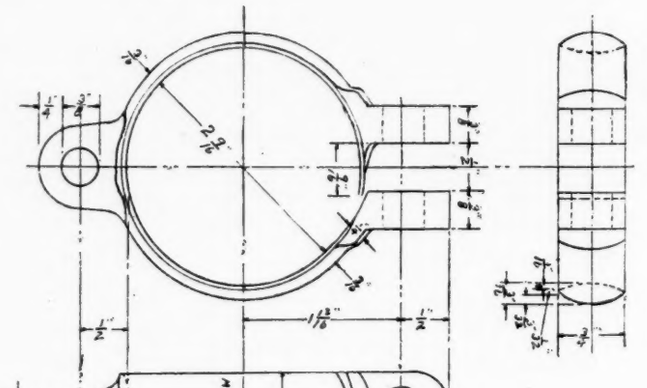


Fig. 3—Hose Clamp Recommended for Standard.

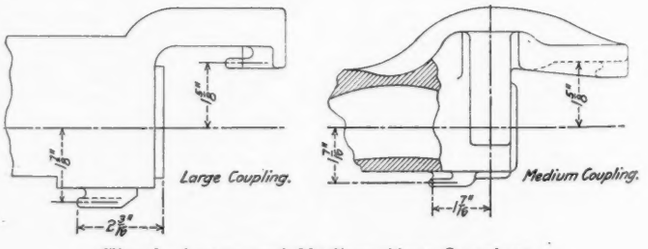


Fig. 4—Large and Medium Hose-Couplers.

the past year, the committee makes the same recommendations, except recommendations for the coupler.

In regard to couplers, the committee finds a large number of roads using the so-called large coupler with 1½-in. full-opening gasket, and equally, if not a larger number, using the medium size with 1⅜-in. full-opening gasket, and a very small number using the small coupler with 1¼-in. full-opening. The latter the committee did not consider, in view of the fact that

the roads using the large size claim they can not operate their long trains successfully with gasket opening less than 1½ in., and the committee being unable to agree on a coupler, two couplers are submitted for the consideration of the Association, which are shown in Fig. 4. The coupler shown as medium coupler with 1⅜-in. can be made to take 1½-in. full-opening gaskets. These couplers are not interchangeable. The question for the Association to decide will be between the heavy coupler with 1½-in. gasket and medium size coupler with 1⅜-in. or 1½-in. full-opening gasket. The committee made service tests of hose to determine the proper angle of the nipple with the opening through the coupler. An equal number of hose manufactured by the same company were fitted up. The angle on half of the couplers was 20 per cent., the other half was 45 per cent. At the end of the test the hose were examined, and there was practically no difference in their condition. While there is no difference in service of the hose by using the larger angle, it is possible to use hose 2 in. shorter, thus effecting quite a saving in hose. Specifications for steam hose have been considered and are submitted herewith. Copies have been submitted to the manufacturers, and their criticisms are also given.

PROPOSED SPECIFICATIONS FOR STEAM-HEAT HOSE.

1. Steam-heat hose must be composed of a tube of rubber, wrapped with 5-ply cotton fabric and the whole covered with rubber.

2. *Tube.* The tube must be hand-made and composed of three calenders of rubber, the middle calender being of a color so much different from the others that the three may be easily distinguished. It must be free from holes, bits of wood, bark, sand and other foreign matter, and from other imperfections. It must be so firmly joined to the fabric that it can not be pulled off without tearing it. It must be free from rubber substitutes.

3. *Fabric.* The fabric must be of duck, made from long-fiber cotton, loosely woven, and weighing not less than 20 ounces per square yard; it must be frictioned on both sides and have, in addition, a distinct layer of rubber on one side, readily visible between the piles when the finished hose is cut open.

4. *Cover.* The cover must be as securely attached to the fabric as is the tube, and be equally free from defects. Both ends of the hose must be covered with caps of rubber, securely vulcanized on in such a manner as to form a continuous member with the tube and cover.

5. *Labels.* Each piece of hose must have securely vulcanized to it a label of white or red rubber, as shown below. The letters and figures must be 1¼ in. high and stand in relief at least 1/32 of an in. Each lot of 200 pieces of hose or less must bear the manufacturer's serial number, beginning with 1 on the first of each year and continuing consecutively until the end of the year. Serial numbers of hose which are rejected must not be used again. With each lot of 200 hose or less, one extra piece must be furnished, free of cost.

6. *Dimensions.*

	Minimum, Inches.	Maximum, Inches.
Length	23¾	24¼
Inner diameter	....	....
Outer diameter	...	....
Thickness of tube	⅛	....
Thickness of cover	1/16	....
Thickness of end caps	1/16	⅛

7. *Tests.* The railway company's inspector will select for test one piece at random from each lot of 201 pieces, and will subject it to the following tests:

A. *Friction Test.* A section one inch long will be cut from the hose and supported in such a manner that it will turn freely on its axis. A 25-lb. weight will be suspended from the separated end of the fabric. The latter must unwind uniformly, if at all, and not faster than 8 in. in ten minutes. This test may be made at any point in the strip of fabric.

B. *Stretching Test.* One-inch-wide strips of both tube and cover will be marked at points 2 in. apart and stretched until the marks are 8 in. apart, and immediately released and remarked at 2 in.. The pieces will then be stretched until the second marks are 8 in. apart and held thus for ten minutes, then released, and at the end of ten minutes more the distance between these marks will be measured. This distance must not exceed 2⅛ in. If the strips break or develop holes extending clear through their thickness during this test, they will be considered to have failed.

C. *Tensile Test.* A 1-inch-wide strip cut from the tube will be marked at points 2 in. apart and the width and thickness will be accurately measured. It will then be slowly stretched in a suitable tensile testing machine until it breaks. The ultimate tensile strength must not be less than 500 lbs. per sq. in., and the elongation at fracture must not be less than 400 per cent. of the original length.

D. *Steam Test.* The remainder of the sample will be suitably mounted on nipples and will be subjected to dry, saturated steam at 50 lbs. pressure for four days of eight hours each, the steam being shut off over night. The cover must not develop any holes or cracks, and the hose must not leak at any point during this test. At the end of the test period the hose will be allowed to cool for sixteen hours, and the friction, stretching and tensile tests will be repeated. The deterioration thus indicated must not exceed 30 per cent. of the figures obtained from the original sample.

E. *Pressure Test.* If desired by the railway company, the piece remaining from the steaming test may be subjected continuously to dry, saturated steam at 100 lbs. pressure for 200 hours, which it must stand without bursting.

8. If the sample fails to pass the above tests, the lot represented by it will be rejected, and the same serial number must not be applied to any other steam hose during the same calendar year. If the sample passes all of the tests, all pieces represented by it will be accepted if free from injurious mechanical defects.

Rejected hose will be returned at the expense of the manufacturer.

CRITICISMS ON SPECIFICATIONS FROM THE MANUFACTURERS.

2. "I presume the object of requiring a middle calender of different color is to prevent the manufacturer from making the tube on a tube machine. Is there any definite proof that a tube run on a tube machine is not as serviceable as a calendered one? It seems to me that if the tube meets all the tests, that is all that is necessary, and such small points of construction should be left to the manufacturer.

I. S. DOWNING,

Chairman, Committee on Train Pipe and Connections for Steam Heat.

"It is hardly necessary for a tube to be so firmly joined to the friction that it tears when being separated. If this were the case, it would be difficult to obtain a test piece for tests given later in the specifications. An adhesion equal to that called for in the friction test would be sufficient.

4. Comment same as for No. 2.

7. (A) "I would consider a 20-lb. dead-weight test sufficient. A 25-lb. friction increases the cost of the hose, without any particular advantage in service.

(B) "A stretching test is seldom made on steam hose, for the reason that compounds which best resist the action of steam do not take a great stretch or have a small set. I see no advantage but a decided disadvantage in this test to insure good steam-resisting hose.

(C) "It is difficult to obtain an accurate tensile on a straight 1-in. strip. A much more accurate tensile can be obtained on a ½-in. piece cut with a die made for the purpose which is wider at the ends where the piece fits into the jaws of the tensile machine. A low tensile and big elongation will give a soft piece of rubber unfit for resisting steam. Good steam-resisting compounds usually have a tensile higher than 500 lbs. and elongation less than 400 per cent.

(D) "Not enough detail is given in any of the tests given above, leaving too much room for misunderstanding. Much more should be said as to what is meant by 30 per cent. deterioration on the different tests. In the after-steaming friction test

is the deterioration to be figured from the decrease in weight that will pull as much as the 25-lb. weight did before steaming, or will the increased number of inches the 25-lb. weight pulls after steaming be used to figure the deterioration? How would you figure the deterioration on the stretch and set test? Such points should be made clear in the specifications.

"In these specifications, and in most rubber-goods specifications in general, not enough details are given as to the exact method of carrying out the tests. In your own interest, you should eliminate from your testing methods the factor of personal equation and possibility of misunderstanding. Inasmuch as is possible, your specifications should be so worded that there can be no doubt as to how the test is to be carried out and what result is expected or demanded for approval. You should eliminate from specifications things about which there are no data to prove their value—in other words, the test should require no property of the material, the value of which is not known. You should specify physical properties which have a definite bearing upon the quality of the article. The design and use to which the article is to be put should in every case determine the nature and severity of the test. A good factor of safety should be arranged for, but there is absolutely no need for a test four or five times as severe as the article gets in actual service."

RECOMMENDATIONS.

The committee would recommend that the following be submitted to letter ballot for adoption as Standards in the Association:

1. Two-inch train line.
2. End valves with not less than 1½-in. opening.
3. Location of steam, air and signal pipe as shown in Fig. 1.

The committee would recommend that the following be submitted to letter ballot for adoption as recommended Practice of the Association:

1. Nipple, as shown in Fig. 2.
2. Steam hose, five-ply, 1½ in. inside diameter, as shown in last year's report on Print D.

NOTE.—Length to be omitted until the Association has adopted a coupler showing the standard angle.

3. Hose clamp as shown in Fig. 3.
4. Each end of hose to be fitted with nipple as shown in Fig. 2.
5. Specifications for steam hose as noted.

The report is signed by:—C. A. Schroyer (C. & N. W.), chairman; W. C. Arp (Vandalia); J. J. Ewing (C. & O.) and J. S. Downing (L. S. & M. S.).

DISCUSSION.

Mr. Downing: The committee has not been able to agree on the coupler.

H. LaRue (C., R. I. & P.): I think we should send the committee back to consider the matter until they do agree. I would like to ask the reason for the change of the location of the steam pipe from the center line of shank of coupler from 9½ in. to 8 in., also the new location for the air and signal pipes. It seems to have been a change, as near as I can determine, of 1½ in.

Mr. Downing: The old standard showed the distance from the center line of the shank of the coupler. This shows the distance from the center line of the car which is just the same location as was shown on the old standard. The hose is in the same location, and there are a good many straight shank couplers being built, and the coupler being out of center practically all the time, we felt that it would be better to show the center line of the car than the center line of the shank. The hose is the same.

W. E. Dunham (C. & N. W.): I think if you will look at Fig. 1 you will see that the air-brake line ought to be at an angle of 20 deg., the same as in the freight equipment. A great many roads are arranging the air-brake line that way. I think that ought to be changed before it is made standard.

As regards the nipple shown in Fig. 2, I think but a very few roads consider that as a good nipple. There is a great deal of trouble with the nipples pulling out and many roads are using the nipple with a rib around it, on which a two-piece clamp goes over the rib. I do not believe that is a good standard for the association to adopt at this time. The same remarks would apply to the clamp as shown in Fig. 3.

C. D. Young (Penna.): The hose required in the paper has enlarged ends, having a difference in diameter of 3/16 in. It has been our experience that if the manufacturer fabricated hose of a large number of ply over two diameters, a great deal of trouble is experienced in getting good friction, owing to the fact that you have to wind the same fabric over two diameters. I feel that a straight hose is to be preferred to one with enlarged ends. There is no provision made for the manufacturer's serial number on the badge plate which is practically a necessity, if you are purchasing hose under specification, in order to identify the material. Neither do I find on the badge plate the letters "M. C. B." which should certainly be required so that the lines in interchange would know that the hose offered on the car had been purchased under this specification.

Referring to Fig. 3, our experience with the steam hose on long cars is that a large overhang is necessary in using the two-piece clamp, with the lips, so as to hold the heavy hose on the nipple fit. With the heavy couplers which are used, it is almost essential to have a mechanical fit between the nipple and the clamp. Our experience with 5-ply hose has not been entirely satisfactory, and we believe that for high pressure lines, where you are using 120 to 130 lb. of steam, that 6-ply will give very much better service. The increase of one-ply makes little difference in the stiffness or weight of hose and the hose gives much better service under that steam pressure. I believe that the roads which are using a head-end system and are coupling up for turbo-generators with 5-ply hose will have considerable trouble from burst hose with even fairly new hose.

In paragraph 3 of the specifications, it requires that the duck shall be 20 ounces to the square yard. I would like to ask how the committee expect to measure it. The hose is offered as a finished product, and the rubber is imbedded in and attached to the duck, and I do not quite see how the committee will weigh the duck with the calendar attached to it. It seems to me it is very desirable to have in the specifications the duck required, and it should be so stated that we can measure just what is being furnished. I would suggest that the committee standardize the duck required, as at the present time the manufacturers seem to have no standard for 20-oz. material. I have some figures here from five manufacturers of hose. Manufacturer *A* uses 15 x 27 strands per inch, 5 x 3 threads per strand; manufacturer *B* uses 19 x 26 strands per inch, and 5 x 3 threads per strand; manufacturer *C* uses 18 x 26 strands per inch, and 5 x 3 threads per strand; manufacturer *D* uses 24 x 28 strands per inch, and 4 x 3 threads per strand; and manufacturer *E* uses 21 x 22 strands per inch, and 7 x 7 threads per strand.

In making tensile test of these different ducks, there is quite a variation, and I have the figures there of the strengths but it is not necessary to read them. I will say there is considerable variation, and it seems to me, in preference to the simple language which is contained in the specification, *i. e.*, "fabric must be of duck made from long-fiber cotton, loosely woven, and weighing not less than 20 ounces per square yard," that this paragraph should be reconstructed to give the strands per inch, the threads per strand, and the load on the section, so many inches in width for the warp and so many inches for the filler, and in this way it can be determined from the hose which has been offered just what duck has been furnished.

Referring to paragraph 7-A, the friction test: If the section for the friction test is taken where the large end comes down to the small diameter, that is permitted under this paragraph, it will be impossible to meet hardly any friction test at all, as the calendar will have no strength at the place where the duck is stretched over two diameters. I do not believe there is any steam hose made to-day that will pass this specification if the sample was selected at that point.

In section *B* relating to the stretching test, I am inclined to think from our experience that the 8-in. stretch will give too soft a tube which will be undesirable for steam hose. It is absolutely necessary in order to get a high temperature hose to have a high amount of mineral matter in the mixture of the tube, and where a high amount of mineral matter is used, it is necessary to have a more lenient stretching test, and I suggest that this section be looked into further, and that the committee recommend that a 6-in. stretching test be used instead of the 8-in. stretching test. The permanent set required of ⅛ in. for 10 minutes, applies equally to these remarks, as to the length of the stretch. If a highly mineralized filler is used, it is desirable for steam heat work, that the permanent set shall naturally be lower, and it seems to me that the permanent set should be taken out of this paragraph.

The tensile test, paragraph 7-C, calls for a test piece 1-in. wide. I believe it to be fair both to the manufacturer and consumer that it is desirable to have enlarged ends on the test piece and to recommend the test piece which is generally used by laboratories in making this test, one-half inch, and enlarged ends of an inch. 200 per cent. elongation is required under this paragraph, which, for the same reasons stated under paragraph 7-B, I believe to be too high, and it should be reduced to get a good steam hose. It is very necessary in water or air-brake hose, to have a long elongation, but in steam hose service I believe the lower elongation will make better material.

In paragraph 7-D, under the steam test, after the hose has been put into the digester, as required, it is provided that deterioration shall not exceed 30 per cent. I would like to ask the committee how, under paragraph 7-A, friction test, this 30 per cent. deterioration is to be measured. In this paragraph it is required that a 25 lb. weight will be used, and that the hose shall not unwind faster than 8 in. in 10 minutes. You have three factors there which should be considered in deterioration. Does the committee mean to take 30 per cent. for the weight, 30 per cent. for the distance and 30 per cent. for the time, or only one of these requirements, and if so, which one?

Under the pressure test, paragraph 7-E, I believe that under specification requirements as to duck and friction that the 200-hour, 100-lb. pressure could be very easily increased to 300, and very satisfactorily pass the test, I would recommend that this be increased.

In view of the fact that I have made so many objections, I would recommend that this be referred back to the committee for further consideration.

I. S. Downing (L. S. & M. S.): We are obliged to Mr. Young. There was a Pennsylvania Railroad representative on the committee. Unfortunately he did not attend any of the meetings. It would be useless for any of us to try to argue with Mr. Young in regard to this specification, as we are not expert in that line, and for that reason I will not attempt to answer him or to defend the report any more than to say that we had an expert from one of the leading manufacturers, and also an expert chemist, and the Pennsylvania Specifications for them to work with, and that is the result of their work. Unfortunately there are none of the experts present. It would be a very good idea, I believe, if this report was referred back to the committee, and I know that the other members of the committee would be very pleased to have Mr. Young a member of this committee. None of the manufacturers would write us a specification. We feel that if this matter was started right, it would bring the manufacturers in line and get them to either approve or make objections to these specifications, and in that way we could make progress.

Mr. LaRue: I would emphasize Mr. Dunham's remarks in regard to the angle of the angle-cock. I see no valid reason why there should be any change made. We cannot locate the pipes so that we can get the same angle on our passenger car drawings as is shown in the freight car drawings, and I believe it is just as necessary on the passenger cars as on freight cars.

C. A. Schroyer (C. & N. W.): I want to say, as regards that, that we can show the angle of these cut-out cocks at any degree, it makes no difference, because they must be made to meet requirements. When you locate the cocks and couple the cars together, and find the hose is chafing against each other, what will you do? You will turn the angle so that they will clear each other.

As regards the specifications for the hose, we cannot get very much worse hose than we are getting to-day. You all know the trouble you are having. The hose could not be made very much worse, but don't you think it would be a good idea to make a move to adopt some standard methods, and then improve on these methods, and not let the matter go on year after year without any action as we have been doing. We have been trying for 3 years to get a report on this subject of hose. Let us do something now. Let us begin to work from the specifications we have presented, using this specification as a basis on which to make improvements and to frame other specifications in the future. As regards the 20-oz. duck, we have always bought duck and indicated the weight of the duck by the ounce, not by the number of threads, or the size of the mesh, or anything of that kind. If we specify 20-oz. duck, the manufacturers will use 20-oz. duck.

Mr. Young: I wanted to say that I omitted to preface my remarks about the specification by saying that I feel the material which is specified in these requirements would probably make very satisfactory steam heat hose. I thoroughly believe the committee has prepared specification which will give better material than the average railway is getting today for steam heat purposes, but I brought up these points to illustrate the testing under the specifications would be a difficult matter as the laboratory must have certain information in order to know that the material is in accordance with the specification and certain details of information must be furnished. The omission of these details makes it very difficult for them to do the work. I agree with Mr. Schroyer that it would be a good thing to let this report go to letter ballot for recommended practice if the committee will take up these details which I have cited in reference to specifications next year, with a view of bringing the subject up again at the next convention. I think it is very desirable to have something for the railways to purchase under, which we do not have at the present time, particularly in regard to the steam heat hose.

F. F. Gaines (C. of Ga.): I agree with Mr. Schroyer that we cannot possibly have anything worse than what we are getting now, and there is a chance of getting a little better hose if we have a specification, and if it is in order I move that we adopt the specification as recommended practice and the committee continued to revise the specification next year.

The President: Will Mr. Young accept that as an amendment?

Mr. Young: Yes.

S. B. Andrews (S. A. L.): I would call attention to the specification for the label, paragraph No. 5, where it says: "The letters and figures must be ¼ in. high and stand in relief at least 1/32 in." That does not seem to be clearly understood by the manufacturers and in place of the word "stand" I suggest we use the word "raised," and that they be at least 1/32 in. above the plane of the badge, the portion of the sentence to read "and raised in relief at least 1/32 of an inch."

TANK CARS.

The tank car committee herewith submits a revision of the existing tank car specifications.

This revision was primarily brought about by the growth in shipments of products which were not handled in tank cars at the time when the original specifications were drawn. It has been considered advisable to also rearrange the order of the paragraphs of the specifications, so as to make it more logical.

Since the original specifications were drawn the great increase in the shipments of naphthas has been a very marked feature of the tank-car business; and within the last 4 or 5 years a new product, known under various names, but principally as "casing head naphtha," has been developed and is now offered for shipment in tank cars.

This product is obtained through the compression, cooling and subsequent expansion of natural gas, which yields a very volatile product, of undoubted value, but also presenting special problems when handled in tank cars. A description of the product will be found under the head of "Liquefied Petroleum Gas," on page 35 of the report of the chief inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, February, 1912; also in Technical Paper No. 10, Bureau of Mines, Department of the Interior, entitled "Liquefied Products from Natural Gas," and therefore it need not be further described here.

The raw product, especially that from certain of the gas fields, is entirely too volatile to be shipped, and consequently it is subjected to a partial evaporation, known as "weathering." The resultant liquid, after the evaporation of some of the lighter products, is what is offered for transportation.

This natural gasoline showed a sudden mounting in pressure when the tank was exposed to the flame, the gas catching fire and burning above the safety valve. Generally, it will be noted that the time interval from the lighting of the fire to the initial blowing of the safety valve was very much less with the natural gasoline used than with the refinery gasoline.

When the original specifications were drawn none of the products which were shipped in tank cars showed high vapor tension at the ordinary temperature of transportation, and the setting of the safety valves at 8 lbs. was considered ample to prevent the escape of the liquid in a gaseous form, and at the same time it was shown that it relieved the cars of any dangerous pressure, even in the event of a fierce fire.

The new products have developed a very much higher vapor tension at ordinary temperatures, and the Interstate Commerce Commission has provided for the transportation of such products by a rule reading:

GROUP 2—INFLAMMABLE LIQUIDS.

"RULE 1824. All inflammable liquids in this group must be shipped in . . . . . , or in tank cars, provided the vapor tension of the inflammable liquid corresponding to a temperature of 100 deg. F. (90 deg. F. November 1 to March 1) does not exceed 10 lbs. per sq. in.

"Liquefied petroleum gas is a condensate from the 'casing head gas' of petroleum oil wells, whose vapor tension at 100 deg. F. (90 deg. F. November 1 to March 1) exceeds 10 lbs. per sq. in. Liquefied petroleum gas must be shipped in . . . . , or in tank cars especially constructed and approved for this service by the Master Car Builders' Association. When the vapor pressure at 100 deg. F. exceeds 25 lbs. per sq. in., cylinders, as prescribed for compressed gases, must be used."

The producers of this product petitioned for a safety-valve setting of 25 lbs., complaining of the excessive losses of the product when shipped in the ordinary tank cars.

Before agreeing to any change in existing tank cars, the tank car committee felt that it was necessary to determine whether the safety valves as prescribed for the ordinary product were adequate to relieve tanks of the usual capacity when loaded with the new product.

It was decided that for this purpose a tank of greatly re-

duced capacity should be used, equipped with safety valves of reduced size, but of the same type as those used on the standard tank cars, and of a capacity as nearly as possible proportioned to the experimental tank.

The American Welding Company, Carbondale, Pa., offered to prepare a welded tank, similar in form to that of the cars, the shell, ends, and dome being all welded, the only cost to the association to be that of the steel plate used, the tank to be returned to the makers after the test. This tank was shipped to Follansbee, West Virginia, mounted on brick piers, and provision made for a gasoline fire underneath, very much as was done at Lima when the original specifications were framed.

Three safety valves, of which one was as nearly as possible of an estimated capacity comparative with that of the standard safety valve on the 6,000-gallon tank, one of an estimated capacity 25 per cent. less, and a third having a capacity of 25 per cent. greater, were prepared and furnished by the Crane Company, free of cost. The first two of these valves were those used in the tests.

The plan was to make fire tests with the same grade of oil that was used at Lima, and then with the new product from the gas wells, with the hope that the resulting pressures from the new product would be near enough to those developed by the refinery product to obviate the necessity for any modification in the requirements for safety valves, and to avoid the necessity of tests with full-size tanks.

The Atlantic Refining Company agreed to duplicate the material used in the original tests, record of which was in existence, and furnished without cost to the association 1,600 gallons of gasoline, 66-deg. Baumé gravity, which was prepared as a close cut—in other words, the gravity was that of a fairly homogeneous liquid, rather than a blend of high and low values. This was very desirable, so as to maintain the gravity of the liquid fairly constant during the tests. This liquid will be alluded to hereafter as "refinery gasoline."

The condensed or casing head naphtha was obtained from the wells immediately around Follansbee, and varied both in gravity and vapor tension, as will be noted in the record of the tests.

Seven tests were made, viz.:

No. 1, refinery gasoline, No. 2 (normal) safety valve, 12-lb. setting.

No. 2, casing head naphtha, same value as No. 1, same setting.

No. 3, casing head naphtha, No. 1 (25 per cent. less) safety valve, 12-lb. setting.

No. 4, casing head naphtha, No. 2 safety valve, 20-lb. setting.

No. 5, refinery gasoline, No. 2 valve, 20-lb. setting.

No 6, refinery gasoline, No. 1 safety valve 12-lb. setting

No. 7, refinery gasoline, No. 2 safety valve, 12-lb. setting. This was a repetition of Test No. 1, in which the burners were not working well, and the heat was not, consequently, as great as in the subsequent tests.

From the results obtained the committee believes that the present standard M. C. B. size of safety valve will fully meet the requirements and properly relieve the pressure when transporting gasoline of a gage as high as 88 deg. Baumé. This in view of the fact that the fires employed during the tests were probably more severe than those to which tanks would be exposed during fires resulting from accidents.

From the vapor tensions shown it was evident that casing head naphtha can not be even normally handled in the present tank cars with valves set at 8 lbs., and that even with the 12-lb. setting there would probably be a loss of liquid through evaporation.

While the present type of tank car would better suit this business with all valves set at 12 lbs. than with the present setting, where at least one valve is set at 8 lbs.; nevertheless it is evident that for the economical handling of this particular grade of gasoline a higher setting is desirable.

The committee feels, however, that rather than to allow the setting down of the valves on the existing tank cars, which aggregate between 35,000 and 40,000 in number, it is better to provide a special car for this particular product, and in doing so to provide for a setting of 20 lbs.

It is believed that the total equipment necessary to handle this entire business would be less than one per cent. of the total tank-car equipment of the country.

While it is perfectly practicable to provide tanks which would be safe with very much higher pressures than 20 lbs., it is felt that it would be undesirable to do so, for the reason that in case of any injury to the tank in the course of transportation, the higher pressures would involve greater dangers in the handling of the cars, and therefore, for the present at any rate, the committee does not recommend any higher setting.

It is evident that any means which will retard the admission of heat to tank cars carrying such materials as casing head naphtha will probably prevent the attainment of the high temperatures which would be reached through the exposure of the naked tank to the summer sun. To determine this a final test was made at Altoona.

The same tank was employed, being lagged with 2 in. of magnesia lagging, protected by a sheet-iron jacket. This tank was mounted again as at Follansbee, and filled with casing head naphtha having a gravity of approximately 87 deg. Baumé at 60 deg. F. The valve used was No. 2, with 20-lb. setting. The fire was obtained by small wood and kerosene.

In this test over two hours elapsed between lighting the fire and the appearance of any flame at the safety valve, notwithstanding the fact that about a half cord of wood and 10 barrels of kerosene were used to maintain the heat under the tank during the test, which lasted about 4 hours.

The results of this test show that whereas with the naked tank the safety valve opened in about 2 minutes after the lighting of the fire, with the lagged tank it required 2 hours and 22 minutes; and that whereas with the naked tank the outage per minute amounted to as much as 114.6 lbs., with the lagged tank this was reduced to a little over 6.6 lbs., and it is probable that had the fire not been so severe as to burn through the sheet-iron jacket, causing part of the magnesia lagging to fall down, the outage would have been considerably less.

This leads to the conclusion that the high vapor tension naphthas should preferably be handled in special cars and that these cars should be lagged to reduce the absorption of heat; under which condition it is most probable that a vapor tension sufficient to raise the safety valve would never be reached.

The attention of the committee has also been called to the question of handling liquefied chlorine gas in tank cars. This material is used for the removal of the tin from tin scrap.

The number of tank cars in use for this purpose is small, and at the time attention was called to the matter they were not equipped with any safety valves or relief of any kind.

The tanks are welded, and completely lagged, and the shippers, who are also the consignees, objected to the regular safety valve, owing to the fact that the liquid evaporates very sluggishly, that it is exceedingly objectionable when liberated, and that the gas is non-corrosive while dry, but very corrosive in the presence of water.

Various forms of safety valves have been submitted by the shippers, but have been respected by the committee, for the reason that the setting of the valve could be controlled by a handle, so as to shut it off from action as a safety valve. The owners have agreed, however, to provide a combination of safety valve and fusible plug which will insure tightness.

To settle the question of whether the tank would be relieved before it could reasonably be expected that the fusible metal would start, a test was made at the works of the Goldschmidt Detinning Company, Chrome, New Jersey, with a small-size tank.

The tank was 19 in. diameter inside, 6 ft. 8½ in. long over all, with spherical heads, 19 in. radius; made of ¾-in. steel; all seams welded. It had a dome 12 in. diameter inside, 9½ in. high above sheel of tank, made of cast steel, 1 in. thick, with cover of cast steel secured by bolts. The tank was designed for a working pressure of 300 lbs., and tested to 400 lbs. per sq. in. It was insulated by lagging with two 1½ in. layers of asbestos sponge felt and one 2 in. layer of vitribestos, covered with a sheet-iron jacket, the lagging being carried over sides, ends and dome.

The tank was filled to within a short distance of the top with 1,050 lbs. of liquid chlorine, the gages showing a pressure of 42 lbs. per sq. in., and an atmospheric temperature of 44 deg. F. when the fire was lighted.

The log of the test shows that though exposed to a fire which was certainly as fierce as any which could be expected in a wreck, the exposure of 3 hours and 26 minutes raised the pressure to but 150 lbs., and the temperature to but 140 deg. F.

The tendency with a full-size tank car would be to still further reduce the rate of pressure rise, owing to the fact that the cubic contents increase as the cube of the dimensions, whereas the heating surface increases but as the square of the dimensions.

The committee feels that from the results shown, the probability of reaching a bursting pressure during the duration of an ordinary fire would be remote. Nevertheless, a combined

safety valve and fusible plug, which the users of these cars are perfectly willing to apply, will be called for.

It is probable that from time to time other products, such as compressed oil gases, transported for buoy lighting, compressed oxygen gas for acetylene welding, etc., will be cared for, and it is recommended that it be required that such questions be submitted to the association with the designs proposed for special cars, for these purposes, for the consideration of the proper committee and the approval of the association.

SAFETY VALVES.

The standard safety valves have proved entirely reliable for relieving the pressure where tank cars carrying inflammable products have been exposed to accidental fire. The port or ports of the valve, which are directed downward toward the tank, should be closed, however, to prevent the injury of the tank by the burning gas thus directed upon it.

A safety valve has been submitted to the committee as an alternative for the standard safety valve. The changes are in the form of the seat, to facilitate grinding and to provide a better escape for water which may lodge on top of the valve, it having been complained that in some cases the ordinary form of valve does not have sufficient depth to accommodate the water and cinders which lodge, and that these cinders cause corrosion. Another change is in the form of the lip, which is more flaring, to give a freer discharge of the gas when the valve opens. The form of the valve and stem has also been changed, the stem being free from the valve, so as to prevent any possibility of cocking the spring cage. Still another change is in the form of the top of the eye on top of the valve, which is flattened and provided with a hole, so that the valve may be rotated on its seat, as well as lifted, using a plain pointed fid.

A test of these valves was made, using an empty tank car with a large steam connection, and both the modified valve and the standard valve. All of the valves were found to work very well—popping freely, the pressure dropping ½ lb. before the valve seated. The form of the discharge of the valve was very satisfactory, and your committee is prepared to accept this valve should the designers wish to use it.

The test indicated that the holes in the bottom of the cinder cavity, especially where pointed downward, are objectionable, as during the time the valve is open gas is discharged downward, and in the case of the test at Follansbee it provided a gas flame of a high temperature, which, impinging on the tank, was evidently injurious.

In the proposed alternative valve but one port is provided, and this is turned so as to throw the flame horizontally as far as possible away from the tank.

As regards the setting of the safety valves on existing tanks, the only question is one of expense.

It is claimed that a very large part of the tank car equipment now equipped with safety valves is carrying products having a flash point higher than 80 deg. F., and that with such a product the vapor tension never reaches the eight pounds to which the tank valves are now set.

In the shipment of naphthas, however, especially those of light gravity, there is a probability that the vapor tension, under summer conditions, may exceed 8 lbs., and since the wording of the I. C. C. rule provides for the shipment of products having a vapor tension of not over 10 lbs., it is evidently desirable that safety valves carrying such products shall not allow the leakage of any product which comes within the terms of the requirements, and, consequently, the committee recommends that all new cars and all existing cars which are in the business of carrying naphthas shall have safety valves set at 12 lbs. pressure. Also, that all new valves, and all valves which have to be reset to a pressure of 12 lbs., which in time will result in all valves, except those on special cars, being set at this pressure, and will allow existing cars to handle casing head naphthas which have been weathered so as to show not more than 10 lbs. pressure at 100 deg. F.

The committee believes, however, that the higher safety valve setting of 20 lbs. should be restricted to the special cars assigned to the casing head naphtha business, rather than to require existing cars to be changed to accommodate this particular traffic.

DISCHARGE VALVES.

Complaints have reached the committee which show the necessity for improvement in the construction of the discharge valves on a great part of the existing tank cars. In some cases the valves are attached to the bottom of a nipple extending downwards from the tank, so that in the event of a serious shifting of the tank in the frame or any derailment the nipple is exposed to breakage, with consequent escape of the tank contents.

The committee believes that the better plan would be to have the valve entirely within the body of the tank, the outside extension being merely for the purpose of making connection to the discharge piping, and that the valve should be so placed that, in the event of the breakage of the extension, the valve itself would not be unseated.

Plans have been proposed to dispense with the bottom discharge valve, the scheme in brief consisting of a pipe through the upper part of the tank, reaching downward almost to the bottom into a pocket secured to the bottom, the discharge of the tank being effected by means of compressed air, as now common practice with cars carrying acids. The committee believes that this will be a satisfactory arrangement, and recommends making it optional with car owners.

WELDED TANKS.

The construction of the experimental tank used in the tests at Follansbee and Altoona, which was welded without seams, and which after 8 fire tests does not show any injurious effects from the fires, and has never shown any indication of leakage, indicates that it is possible by this process to make very desirable tanks from the tightness standpoint. The committee believes that this is a very desirable form of tank, due to the absolute tightness which results from the absence of seams, and that tanks of this form should be accepted as an option, but the committee is not prepared to require this form of construction. It does recognize the fact, however, that absolute tightness, particularly when hauling inflammables which are normally under pressure, is a very desirable feature.

The committee feels that the time has come when the safety valves on tank cars should be periodically tested, and the test pressure and date stenciled on the valve, and in order that this may be carried out, it recommends that the absence of the test within the prescribed period and of the stenciling shall be considered an owner's defect.

The report is signed by:—A. W. Gibbs (Penn.), chairman; C. E. Chambers (C. of N. J.), S. K. Dickerson (L. S. & M. S.), E. J. Searles (B. & O.), J. W. Fogg (B. & O.), Wm. Schlafge (Erie) and Thos. Beaghen, Jr. (Union Tank Line).

The following appendix contains the specifications for tank cars.

DEFINITIONS.

Tank Car. Any car to which one or more tanks, used for carrying liquids or compressed gases, are permanently attached.

Tank cars shall be divided into two classes: Ordinary and special.

Ordinary Tank Car. One used for the transportation of products, the vapor pressure of which, at a temperature of 100 deg. F., does not exceed 10 lbs. per sq. in.

Special Tank Car. One used for the transportation of products, the vapor pressure of which, at a temperature of 100 deg. F., may exceed 10 lbs. per sq. in.

GENERAL REQUIREMENTS.

(a) Tank cars offered for movement over the lines of a railway must conform to the following specification.

(b) Tanks which bear evidence of damage by fire must be withdrawn from transportation service.

ORDINARY TANK CARS, OTHER THAN WOODEN UNDERFRAME CARS.

1. No tank cars built hereafter shall be accepted for transportation unless equipped with steel underframing or with reinforced shell. The design and construction of the car throughout must be at least as strong as the following detailed specifications.

2. Steel or iron tanks constructed subsequent to 1903 must be designed for a bursting pressure of not less than 240 lbs. per sq. in.

3. When riveted, all longitudinal and head seams must be double-riveted. Where head blocks are not used, head seams need not be double-riveted.

4. Dome heads and covers must be made of either cast or pressed steel, or of malleable iron. The joint of the dome cap must be made tight against vapor pressure, and when necessary to insure this a satisfactory gasket must be used.

5. Tanks must be carefully inspected and tested with cold-water pressure at least once in 10 years. The test for tanks built prior to 1903 shall be at 40 lbs. per sq. in., and for tanks built since that date at 60 lbs. per sq. in., cold-water pressure, which they must stand without leak or evidence of distress. This inspection and test must be made by the tank-car owners. Tanks when tested must be stenciled with date and place where test was made, and by whom, as follows:

Tested (date) .....
Pressure (pounds per square inch).....
At (place) .....
By (name of firm).....

6. By January 1, 1914, all tanks carrying products that give off volatile inflammable vapors at or below a tempera-

ture of 80 deg. F., and having a vapor pressure of 10 lbs. per sq. in. at a temperature of 100 deg. F., shall be equipped with 5-in. safety valves of approved design, and these valves shall be set to open at a pressure of 12 lbs. per sq. in.

Provided, that where the lading is such as not to give off inflammable vapors (as determined by flash point from Tagliabue's open-cup tester as used for test of burning oils) at a temperature below 80 deg. F., the setting of the 8-lb. valves to 12 lb. may be deferred to such time as the valves require removal.

All required pressures for safety valves are subject to a tolerance of 1 lb. above or below that specified. One valve shall be provided for a capacity of 6,500 gal. or less, and 2 valves for a capacity of more than 6,500 gal.

Where tanks carrying such products are divided into compartments, each compartment must be provided with a safety valve.

7. All safety valves must be tested and adjusted, if necessary, by January 1, 1914, and at intervals of not over 2 years thereafter, and the date of the last test and pressure at which valve is set shall be plainly stenciled on the body of the valve, as follows:

Tested (date) .....
Pressure (pounds per square inch).....
At (place) .....
By (name of firm).....

The test may be made without the removal of the valve from the car, provided the valve unseats at a total pressure corresponding with the area of the seat multiplied by the required pressure. Valves improperly set, or not tested and stenciled at proper intervals, shall constitute defects for which owner shall be responsible.

8. Tank cars carrying volatile non-inflammable products whose vapor pressure at a temperature of 100 deg. F. does not exceed 10 lbs. per sq. in., may be provided with vents depending on frangible lead disks for safety, which vents shall be of approved design or the disks to be of a thickness that shall insure rupture at a pressure not higher than 25 lbs. per sq. in.

9. Tank cars carrying non-inflammable or non-volatile material, such as sulphuric acid, vinegar, linseed oil, cottonseed oil, lard oil, fish oil, tannery products, glucose, molasses, calcium chlorid, caustic soda, silicate of soda, etc., need not be provided with 5-in. safety valves, but each tank must have a small open vent or valve, equal to not less than 2 in. in diameter.

If, for any reason, splashing of the liquid or contamination by moisture is to be avoided, a 2-in. vent with frangible lead disk, of a thickness which will insure rupture at a pressure not higher than 20 lbs., should be used in place of the 2-in. open vent.

10. The center-sill construction of the underframe between bolsters must have an effective cross-sectioned area of at least 30 sq. in.

11. Each car must be equipped with steel body and truck bolsters, steel couplers, and a draft gear of approved design, having a capacity of at least 60,000 lbs.

12. Particular attention must be given to the longitudinal anchorage of the tanks, which must be thoroughly substantial, to prevent injurious end-shifting. The preferable method of securing tank against end-shifting is by anchoring the tank to the underframe at or between bolsters, rather than by means of head blocks, inasmuch as the latter method results in damage to underframe forward of body bolster.

MINIMUM REQUIREMENTS FOR LONGITUDINAL ANCHORAGE.

Tank connection:

Shearing area of rivets 25 sq. in.	For tanks of 8 500 gal-
Bearing area of rivets, 20 sq. in.	lons capacity or over.
Shearing area of rivets. 18 sq. in.	For tanks of less than
Bearing area of rivets, 14 sq. in.	8 500 gallons capacity.

Frame connection:

Shearing area of rivets, 12½ sq. in	For tanks of 8,500 gal-
Bearing area of rivets, 10 sq. in.	lons capacity or over.
Shearing area of rivets 9 sq. in.	For tanks of less than
Bearing area of rivets, 7 sq. in.	8 500 gallons capacity.

13. Tanks must be secured from turning on the underframes either by means of an anchorage or by dome yokes, and must also be secured to underframe by means of tank straps, two for tanks not more than 76 in. in diameter, and four for tanks of greater diameter, or their equivalent.

The sectional area of dome yokes and tank bands must at no place be less than ¾ of a sq. in. or 1-in. round iron upset to 1⅛ in. at threaded end. Cars having no underframe, with tank securely riveted to body bolsters, do not require dome yokes or tank bands.

Explanation: A threaded end, 1⅛ in. in diameter or more, with a body consisting of a flat band 2 in. by ⅜ in. or equivalent section; or round iron 1 in. in diameter, will be accepted as meeting the requirements.

The dome yoke proper which passes around the dome may be a rod ¾ in. in diameter, or its equivalent, to which is secured the strap or rod which is fastened to the underframe. The sectional area of dome-yoke strap must be the same as required for tank straps.

Where tanks are equipped with a greater number of tank bands than called for, the total sectional area of all bands will be considered as meeting the requirements, if they equal the total sectional area of the rods specified.

14. Steel underframe tank cars in which the tank is secured from end-shifting by means of head blocks, must have a longitudinal clearance for tank valve extension of not less than 2½ in. on each side of valves.

15. Preferably the top of the discharge-valve handle should be within the tank, but in the the event that it is carried through the dome, precaution must be taken by packing and cap nut against leakage.

16. If the car has no underframe the tank shell at bottom must be at least ⅝ in. thick, and all circumferential seams in bottom sheet, except head seams, must be double-riveted. The sectional area of the additional metal in bottom of tank shell must be at least 20 sq. in.

17. Each car must be equipped with air brakes of a capacity equal to not less than 70 per cent. of the light weight of car, and at least one hand brake operating the brakes on both trucks.

18. There shall be a push-pole pocket at every corner of the car. Where, from the construction of the car, the push-pole pockets cannot well be placed on the body, they must be applied to the trucks, so placed above the journal boxes that the push pole will push toward the center of the truck.

19. Each truck must have a strength equal to or greater than the strength of the axles used.

20. All tank cars at home on a railway must be inspected by inspectors in the employ of that railway company, and when such tank cars meet the requirements herein set forth.

If foreign tank cars and individual tank cars at home on foreign lines, stenciled with the legend "M. C. B. Construction" by a foreign road, are offered for movement over another railway, and some of the details do not conform to the requirements of the tank-car specification, a report of same should be made through the proper officers to the official in charge of equipment, and the car allowed to proceed until further notice.

OLD TANK CARS HAVING WOODEN UNDERFRAMES.

1. Tank cars having wooden underframes, of railway or individual ownership, will be required to conform to the requirements of the "Specification for Ordinary Tank Cars," relating to test of tanks, safety valves, test of safety valves, 5-in. safety vents with lead disks, 2-in. vent hole or small valve with lead disk, dome yokes, tank straps, etc., brakes, push-pole pockets, trucks, axles, and inspection for compliance with M. C. B. specification, and, in addition, must be as strong as the construction covered by the following detailed specifications:

2. Where tank cars are fitted with cast-iron dome heads and covers not sufficiently strong to stand the necessary 40 lbs. hydraulic test, they must be replaced by others of cast or pressed steel, or of malleable iron.

3. Tank heads less than 7/16 in. thick, bearing evidence of damage from impact with head blocks, should be reinforced at bottom by means of steel plate shoes ⅜ in. thick, riveted to head and shell.

4. If cars are not equipped with intermediate sills, the underframes must have 2 center sills, each not less than 5 in. wide by 10 in. deep, or the equivalent in strength. If the car is equipped with intermediate sills, the center sills must not be less than 5 in. wide by 9 in. deep, or the equivalent in strength. Center sills must not be spaced more than 18 in. apart.

5. Where draft timbers are underneath the center sills, the space between the center sills must be filled in with timbers not less in depth than center sills, extending from end sill to the center of nearest cross-bearer or cross timber, provided the latter is located not less than 4 ft. 6 in. from center of bolster. On cars where the draft arrangement is between center sills, the filler timber must be extended to the cross-tie timber when the cars go to shop for repairs to center sills. Center sills and filling timbers must be securely bolted together by means of ¾-in. bolts. On cars having center or intermediate sills not less than 10 in. wide by 10 in. deep, which may be made up of two 3 in. by 10 in. sills bolted together, the filling timbers may be omitted.

6. End sills not reinforced by buffer blocks must not be less than 9 in. wide by 10 in. deep. End sills 6 in. wide by 12 in. deep, reinforced with buffer blocks not less than 6 in. wide by 10 in. deep and of sufficient length to overlap center sills, will be acceptable as a substitute for 9 in. by 10 in. end sills.

On existing cars, if buffer blocks are used for the purpose of reinforcing end sills which do not come within the specified

requirements, the buffer blocks in no case must be less than 4 in. thick nor end sills less than 6 in. thick. The total strength of the end sill and buffer block must be equal to the strength of the construction specified.

7. Draft timbers secured to inside of center sills and extending to cross-bearer or cross-timber will be accepted as a substitute for filling timbers referred to above. Where center sills are 9 in. wide by 10 in. deep, or over, and draft timbers are placed between same, they need not extend farther back than body bolster, provided they are adequately secured to center sills by means of seven ⅞-in. bolts or their equivalent, and butt against body bolster. Draft timbers located underneath the center sills must not be less than 4 in. wide by 8 in. deep, and each draft timber must be held to center sills, end sills and buffer blocks by means of 7 or more ⅞-in. bolts or 6 1-in. bolts. Where an arrangement for supporting draft timbers is substituted for one or more bolts and the construction is of equal strength, the same will be acceptable. Draft timbers extending beyond bolster must be secured to center sills by additional bolts.

8. The draft gear and draft attachments must be at least as strong as the design required by these specifications. Cars should be provided with draft-gear stops gained into draft timbers or heeled on end sills, filler timber or body bolster, and secured with 5 ¾-in. bolts; but cars having stops gained into draft timbers or heeled on end sills, filler timber or body bolster, secured with three ¾-in. bolts, may be continued in service until such time as they go to shop for repairs, when 5 bolt stops must be provided. In all cases, tail yokes or attachments of equal strength must be used. Tail bolts, tail straps, or American continuous draft gear, will not be accepted.

9. Head blocks must not be less than 10 in. wide unless reinforced by metal plates, and of sufficient depth to extend at least 6 in. above bottom of tank, and may be made of 2 pieces bolted together and bolted to underframe by means of not less than 4 ⅞-in. vertical bolts. They must be cut out to suit curve of tank. The ends of each head block should preferably be tied to corresponding end of head block at the other end of car by means of rods not less than 1 in. in diameter, with 1⅛-in. threaded ends, and each head block supported at center by means of a substantial casting securely bolted to end and center sills. Where the construction of the car does not permit of this fastening, the following may be substituted:

The ends of each head block tied to corresponding end of head block at the other end of car by rods not less than 1 in. in diameter, with 1⅛-in. threaded ends, and each head block secured by 2 stay rods 1 in. in diameter anchored to center sills;

Or, head block supported at center by means of a substantial casting securely bolted to end and center sills and 2 1-in. rods passing diagonally through head block toward bolster and secured to underframe;

Or, head block secured by two stay rods 1⅜ in. in diameter anchored to center sills;

Or, head block secured by two stay rods 1 in. in diameter, anchored to center sills, and two 1-in. rods passing diagonally through head block toward bolster and secured to underframe;

Or, head block secured by 2 stay rods 1 in. in diameter, anchored to center sills, and 2 straps not less than ¾ in. thick and 3 in wide, passing over head blocks and securely fastened to underframe.

SPECIAL TANK CAR FOR CARRYING VOLATILE INFLAMMABLE PRODUCTS WITH A VAPOR TENSION OF OVER 10 LBS. PER SQ. IN. AT A TEMPERATURE OF 100 DEG. F.

1. For these cars the tanks may be either welded or riveted; with or without steel underframes. The welded tank is preferred on account of tightness. Where riveted tanks are used, all longitudinal and head seams must be double-riveted. Heads must be not less than ½ in. thick; and if head blocks are used, heads must not be less than ⅝ in. thick.

2. Domes of steel plate, preferably drawn without vertical seams, riveted or welded to the shell proper. Dome must have a capacity to provide for an expansion of 3½ per cent. of the contents of the tank, measuring from the inside top to shell to the top of the dome. Cover for dome may be secured either by screw joint, by bolting, or by yoke with center screw. Lid must be provided with suitable gasket to insure tightness against the escape of gas under pressure.

3. The safety valves to be of the same pattern as those used for other inflammable products, set to blow at a pressure of 20 lbs. gage pressure, with a tolerance of 1 lb. above or below that pressure.

4. The safety valves must be tested and adjusted, if necessary, at intervals of not over 6 months, and the pressure and date of the last test shall be plainly stenciled on the body of the valve, as follows:

Tested (date) .....
Pressure (pounds per square inch) .....
At (place) .....
By (name) .....

The test may be made without the removal of the valve from the car; provided the valve unseats at a total pressure corresponding with the area of the seat multiplied by 20 lbs. Valves improperly set, or not tested at proper intervals and stenciled, shall constitute defects for which owner shall be responsible.

5. The barrel, ends and dome to be lagged with a thickness of 2 in. of 85 per cent. carbonate of magnesia, or its equivalent, covered with sheet-iron jacket ⅛ in. thick. Tank before lagging to be well painted. The sheets of the jacket to be lapped so as to shed rain and maintain the dryness of the lagging.

6. Tank to be tested before being put into service and once every 2 years thereafter with a cold-water pressure of 100 lbs. per sq. in., which it must stand without leakage or evidence of distress. This test to be made by tank-car owner, and car stenciled with pressure, date and place where test was made, and by whom, as follows:

Tested (date) .....
Pressure (pounds per square inch) .....
At (place) .....
By (name) .....

7. Discharge valves, if used, must be so arranged that the valve shall not project below the bottom of the shell, and the connection pipe must be so arranged that its breakage will not unseat the valve. An alternative arrangement, by which the valve is placed on top of the car and the contents of the car discharged by air, will be accepted.

8. In some convenient location on either the sides or the ends of the car shall be stenciled the words: "For Liquefied Petroleum Gas."

On the side of the dome shall be stenciled: "Caution: Liquefied Petroleum Gas (Casing Head Naphtha): Before removing manhole cover, safety valve must be lifted and held open until the internal pressure, if any, is relieved."

9. All other requirements for these special tank cars to be the same as those for "Ordinary Tank Cars."

10. The designs for these "Special Tank Cars" to be submitted to the Master Car Builders' Association for approval.

SPECIAL TANK CAR FOR TRANSPORTATION OF LIQUEFIED CHLORINE GAS.

1. Liquefied chlorine gas may be shipped in a lagged tank car of approved design, which shall be tested before being put into service with a cold-water pressure of 300 lbs. per sq. in., and stenciled in accordance with the requirements in this respect of the specification for ordinary tank cars.

2. Car shall be provided with an approved design of small safety valve and fusible seal which must be so located that in case the car became involved in a fire the seal would be exposed.

3. The designs for these "Special Tank Cars" to be submitted to the Master Car Builders' Association for approval.

DISCUSSION.

Mr. Gibbs: The manufacturers of the material were very anxious that we should allow the safety valve to be set at a much higher pressure, but the committee were unwilling to allow that. I may say that in all this work we have had not only the co-operation of our own committee, but we have had the co-operation of the Atlantic Refining Company and of the Bureau of Explosives. We have still included in the specifications a specification for wooden underframe tanks. The only reason for retaining it was in changing the order we thought the order might stand afterwards, so that subsequent specifications might cut out all this material, because the rules prevent the construction of any more; so I suggest after this that we cut out all specifications for wooden underframe tanks.

Mr. Brazier: Mr. President, I move that the report be accepted, that whatever recommendations there are be adopted, and furthermore, that the thanks of the Association be extended to that committee.

E. T. Millar (B. & O.): I would like to ask Mr. Gibbs if the tank cars have been used for carrying any particular gas, could naphtha or anything else be carried in such cars?

Mr. Gibbs: My understanding is the cars used for naphtha can be used for any of the naphthas, but would not be suitable for crude oils. If the recommendations of the

committee are adopted, the ordinary tank cars carrying this product will have their safety valves set to 12 lbs., and they can be used for carrying that product which has been weathered or exposed to the air, so its pressure won't run above. Special cars can be used for carrying ordinary gas without any trouble.

Mr. Brazier's motion was carried.

SPECIFICATIONS FOR FREIGHT CAR TRUCK SIDES AND BOLSTERS.

The committee on specifications for truck sides and truck bolsters was appointed by the executive committee in July, 1911, and was instructed to prepare specifications for these structures for freight cars of 80,000, 100,000 and 150,000 lbs. capacity. The appointment of this committee grew out of a recommendation made at last year's convention by the committee on revision of standards. The committee has assumed that it was to deal only with cast-steel structures.

A circular was sent to the members of the Association and to all manufacturers of cast-steel truck sides and bolsters concerning the specifications for the physical and chemical properties of the material and methods of inspection. The information received has formed the basis for the recommendations touching these matters which are embodied in the report. Definite recommendations concerning physical tests of the completed structures are not given, as the funds necessary to make such tests were not available this year. In this connection, however, the committee has had placed at its disposal through the courtesy of C. D. Young, engineer of tests, Pennsylvania Railroad, the results of thorough static and drop tests of bolsters and truck sides of various capacities, and from this information it has drawn up tentative suggestions concerning such tests.

SPECIFICATIONS FOR CAST-STEEL TRUCK SIDES.

The following suggested specifications are based upon a study of specifications now in use by members of the association.

Manufacture.

1. Castings furnished under these specifications must be made of open-hearth steel in accordance with the best foundry methods. They must conform to the dimensions shown on drawings and must be free from rust, scale, blow holes, and shrinkage cracks.

2. Each casting must have the following markings cast upon it in raised figures and letters:

a—Initials of the railway company.
b—Month and year in which cast, thus: 6-12.
c—Manufacturer's serial number and trade-mark (or other designation).
d—M. C. B. S.

3. The manufacturer shall have cast on each truck side two test coupons having a cross section of 1⅛ in. by 1⅛ in. and 6 in. long. These coupons are to be used for the physical and chemical tests and their location upon the casting shall be as specified by the purchaser. There shall be two additional coupons of a cross section not less than the average cross section of the casting, which coupons are to be used to determine the character of the annealing as specified in Section 7.

4. The manufacturer shall protect all castings so that they do not become covered with rust. They must not be painted before inspection unless so specified.

5. Truck sides shall not vary more than 3 per cent. above nor 2 per cent. below what has been determined upon as the normal weight of the casting, except that in case the casting has met all requirements save that of overweight, it may be accepted as of the maximum allowable weight here specified. For the purposes of this requirement, the normal weight shall be previously agreed upon between the purchaser and the manufacturer.

6. When the manufacturer is ready to make shipment of the material, he shall notify the purchaser of that fact and await the arrival of the purchaser's inspector, to whom he must furnish free any assistance and labor needed to make satisfactory inspection, tests, and prompt shipment.

7. All castings shall be thoroughly annealed. Test coupons shall be annealed with the casting before they are detached. To determine the quality of the annealing the inspector will have one of the test coupons, mentioned in Section 3, cut half-way through and broken off from the casting for examination of the fracture. If, in his opinion, the annealing has not been properly done, he may require the casting to be reannealed, using the second test coupon for examination in this case. If, after annealing or reannealing, any casting is so much out of gage as to require heating in order to bring it within the gage, it shall again be annealed before it may be accepted.

Chemical Properties.

8. The chemical composition of the steel shall conform to the following requirements:

Carbon	from 0.20 per cent. to 0.30 per cent.
Manganese	not over 0.70 per cent.
Phosphorus	not over 0.05 per cent.
Sulphur	not over 0.05 per cent.

Physical Properties.

9. The physical properties of the steel shall be as follows:

Ultimate tensile strength, lbs. per sq. in.	not under 60,000
Yield point (by "drop of the beam")	not under 50 per cent. of the ultimate strength
Elongation in 2 in. (per cent.)	not less than the quotient of 1,400,000 divided by the ultimate strength

Inspection.

10. For the purpose of determining whether the physical and chemical requirements are complied with, the inspector shall select at random one casting from each heat. From this casting, the two physical and chemical test coupons (referred to in Section 3) shall be removed by the inspector. One of them shall be subjected to physical tests, but if the coupon casting proves unsound, the other coupon shall be used in its stead for this purpose. From the coupon which has satisfactorily passed the physical requirements, borings shall be made for chemical analysis. In case the test pieces selected do not meet the specifications, all castings from the entire heat represented shall be rejected.

11. At his option, the inspector may require that any or all castings be subjected to sand blast in order to make an examination of the surface for checks or cracks.

12. From each casting rejected by the inspector under these specifications he shall cause to be chipped the "S" of the letters M. C. B. S. which are specified in Section 2.

Tentative Specifications for Static Tests of the Complete Truck Side.

The following tentative specifications are presented for the purpose of securing such criticism as the members of the Association may wish to offer.

13. The truck side selected as representing the heat shall be supported in the testing machine at each end, directly beneath the center line which corresponds to the center of the axle when the truck side is in the truck. The load shall be applied in the center of the bolster opening midway between the points of support, and the allowable deflection shall be measured at this point. When so mounted, the truck side shall be subjected to the initial load stated in the following table. This initial load shall be next reduced to 5,000 lbs. and then increased to the proof load as stated. Under this proof load there shall be no permanent set and the deflection shall not exceed the amount indicated:

For cars of	Initial load, pounds.	Proof load, pounds.	Maximum deflection.
80,000 lbs. capacity	20,000	135,000	⅛ in.
100,000 lbs. capacity	25,000	160,000	⅛ in.
150,000 lbs. capacity	35,000	210,000	⅛ in.

Recommendations Concerning Truck Sides.

The committee recommends:

1. That the specifications concerning freight truck sides contained in Sections 1 to 12, inclusive, be made standards of the Association.

2. That the work of the committee be continued, and that, if possible, funds be provided to make tests upon which specifications for physical tests of the complete truck side may be based.

3. That some committee of the Association, competent to deal with matters of design, be directed to prepare designs of cast-steel truck sides for freight cars of 80,000, 100,000 and 150,000 lbs. capacity, to serve as a guide to those members of the Association who now buy these structures made from designs which they do not themselves prepare; in the expectation that such designs may eventually be added to the recommended practice of the Association.

SPECIFICATIONS FOR CAST-STEEL BOLSTERS.

The following suggested specifications are based upon a study of specifications now in use by members of the Association:

[The following 12 sections are identical with those presented in the specifications of the truck sides, and will therefore be omitted here.—EDITOR.]

Tentative Specifications for Static Tests of the Complete Truck Bolster.

The following tentative specifications are presented for such criticism as the members of the Association may wish to offer.

The static test proposed below is intended to subject the bolster to stresses which shall be similar in amount and direction

to those which it receives in service. To this end the bolster would be inclined in the testing machine both sidewise and endwise, and subjected to a vertical load. The angles chosen would be such as to give the following relative magnitudes to the downward, transverse and longitudinal stresses:

Load normal to the center plate surface	100 per cent.
Side thrust	25 per cent.
End thurst	40 per cent.

The above stated relation between stresses is derived from the report of the committee on axles, journal box, bearing and wedge, page 149 of the Proceedings of the Association for 1896. The proposed tentative specification is as follows:

13. The bolster selected as representing the heat shall be supported in the testing machine as mentioned, it being tilted sidewise through an angle of 13 degs. 4 min., and endwise through an angle of 21 degs. 13 min. The load shall be applied vertically through a block with a horizontal upper face, which rests upon the bolster center plate. When so mounted the bolster shall be subjected to the proof load stated in the following table and the load shall then be decreased to 1,000 lbs. Under this proof load there shall be no permanent set and the deflections shall not exceed the amounts indicated. For the purpose of measuring set and deflections the position of the bolster under the load of 1,000 lbs. shall be considered as the datum.

For Car of	Proof Load.	Deflection Normal to Center plate.	Lateral Deflection.
80,000 lbs. capacity....	110,000 lbs.	0.15 in.	0.10 in.
100,000 lbs. capacity....	140,000 lbs.	0.15 in.	0.10 in.
150,000 lbs. capacity....	210,000 lbs.	0.15 in.	0.10 in.

Recommendations Concerning Truck Bolsters.

The committee recommends:

1. That the specifications concerning freight truck bolsters contained in Sections 1 to 12, inclusive, be made standards of the Association.

2. That the work of the committee be continued, and that, if possible, funds be provided to make tests upon which specifications for physical tests of the complete truck bolster may be based.

3. That some committee of the Association, competent to deal with matters of design, be directed to prepare designs of cast-steel truck bolsters for freight cars of 80,000, 100,000 and 150,000 lbs. capacity, to serve as a guide to those members of the Association who now buy these structures made from designs which they do not themselves prepare; in the expectation that such designs may eventually be added to the recommended practice of the Association.

An appendix to the report gives a synopsis of the answers received from the circular of inquiry.

The report is signed by:—Edward C. Schmidt (Univ. of Ill.), chairman; J. S. Sheafe (Ill. Cent.) and C. D. Young (Penna.).

DISCUSSION.

I. S. Downing (L. S. & M. S.): I think the committee should be continued for another year, and in addition to truck bolsters and truck sides of freight cars, they should consider the question of passenger trucks. I move that the report of the committee be accepted, the committee continued, and that they consider passenger truck frames.

C. D. Young (Penna): Do I understand that that refers the entire matter back to the committee as to the specifications in paragraphs 1 and 2? It seems to me it would be advisable to let the specifications go to letter ballot and the committee be continued if necessary, and go after further details. I would like to amend the motion that the subject matters of one, two and three, be referred to letter ballot.

J. F. DeVoy (C. M. & St. P.): I was rather of the opinion as expressed by Mr. Young, except for recommendation of No. 3, and I am not clear in my mind just how they intended to handle that.

The motion was carried with Mr. Young's amendment.

CAPACITY MARKING OF CARS.

The committee appointed to look into and report on the subject of capacity marking of freight cars desires to refer to the report of the committee on axle limits passed upon by the Association at the meeting held at Atlantic City in June, 1906, (see pages 299 to 310 of the Proceedings for that year).

It would seem this subject of capacity marking of cars was thought to have been definitely disposed of by the Association at that time, and the interchange rules were changed to conform to the recommendations of the committee; it will be noted that Interchange Rule 86 makes it optional with the car owner whether he shall stencil his cars with the light weight and nominal capacity, or with the light weight and maximum weight, depending upon the axle requirements specified in this rule. However, in order to secure the individual car owner's views in regard to this subject at this time, the committee sent out a circular to all car owners.

The committee is in receipt of forty-three replies—a careful analysis of which is as follows:

SUMMARY OF REPLIES TO M. C. B. CIRCULAR NO. 25 CAPACITY MARKING OF FREIGHT CARS.

	No. of Replies.	Cars Represented.
In favor of stenciling cars with their light weight and maximum weight.	19	319,535
Against stenciling cars with their light weight and maximum weight. (There were no specific reasons indicated in the replies).	8	204,085
Against stenciling cars with their light weight and maximum weight for the reason that the maximum weight stenciling is likely to confuse shipper or car inspectors.	6	121,850
Against stenciling cars with their light weight and maximum weight, for the reason that it has not been demonstrated that this practice might not be applied to cars, the body or trucks of which are structurally weak, and which are at present stenciled to carry the maximum load to which they should be subjected)	5	209,153
In favor of stenciling cars with their light weight and nominal capacity, also maximum lading	3	84,079
In favor of stenciling cars with their light weight and nominal capacity plus 10 per cent. (For instance, an 80,000-lb. capacity car would be stenciled 88,000-lb.)	1	14,000
In favor of stenciling cars with their light weight and maximum lading	1	11,000
Totals	43	963,702

It would appear from this that, notwithstanding the authorization given the car owner as expressed by the vote of the

C. E. FULLER,

Chairman, Committee on Capacity Marking of Cars.

Association on this subject at the convention held in June, 1906, a great many companies are timid about adopting the light weight and maximum weight stenciling, for the reason, apparently, that they have no evidence that the construction of cars (including steel and steel underframe equipment) is so consistent as to justify the belief that the car can be loaded up to the full carrying capacity of the axles. It would, therefore, seem desirable for the Master Car Builders' Association to determine for itself the minimum strength of car bodies of each nominal capacity to which the maximum weight stenciling shall apply, and the committee, in order to go into this subject more exhaustively,

would recommend that time be granted in which to further consider this subject and make the report.

The report is signed by C. E. Fuller (U. P.), chairman; M. K. Barnum (I. C.); A. W. Gibbs (Penna.); F. H. Clark (B. & O.) and F. W. Brazier (N. Y. C. & H. R.).

DISCUSSION.

C. A. Seley (C. R. I & P.): I move that the suggestions of the committee be adopted, that they be granted additional time, and that the committee be continued.

The Secretary: I would like to read some comments from Mr. Fuller, the chairman of the committee, which are as follows:

"Referring to the report on capacity marking of freight cars:

"This association, at its 1905 convention, appointed a committee to look into and report the merits of stenciling cars with their light weights and maximum weights; the recommendation of that committee, which clearly set forth the principles I have been advocating, was accepted by the convention held in June, 1906, and having been approved by the convention, committed the members of this association to the practice of ultimately stenciling all cars with their light weights and their maximum weights. Further, in accordance with this idea, certain changes were made in dimensions of axles, and interchange rule No. 23 (present rule No. 86) was promulgated to show the minimum dimensions of axles for the different capacities of cars marked 'maximum weight.' It was thought that a majority of the car owners would avail themselves of the increased measure of carrying capacity thus afforded, after they had increased the sizes of their axles to conform to dimensions prescribed in the interchange rules.

"After the lapse of 6 years in which to work into the axles specified for the different 'maximum weight' stenciling of cars, are we to be held back another indefinite period before we can enjoy the benefits intended by such changes because we are told that some car bodies or trucks may not have been constructed to carry as great a load as the axles? Or are we going to be consistent with ourselves and reconsider and rescind the action taken by the 1906 convention?

"The majority of the committee appointed by this association in June, 1911, is not favorable to the 'maximum weight' plan of stenciling, and car owners are not enthusiastic over the plan as is evidenced by the views expressed in reply to the committee's circular. It would seem from the replies received that a great many car owners want to be 'shown' and the committee has, therefore, incorporated into its report a willingness to 'show' up the carrying capacity of car bodies if its suggestion to do so is approved by this association. It was not possible for the committee to bring in a complete report to this convention, owing to the late date at which the views from the car owners in answer to the committee's circular of inquiry were received. It would seem to be necessary and advisable to remove all doubt relative to the carrying capacity of car bodies, and if it should be found by the committee assigned to that task, that there are steel or steel underframe or all wood cars which are not up to the requirements of the carrying capacity of the axles with increased dimensions as required in interchange rule 86 for 'maximum weight' stenciling, then I must confess that such investigation would be as great a benefit to the railways as the measure to increase the carrying capacity.

"If it were found that some car bodies were structurally weak, I would be in favor of defining the minimum, and would exclude all cars below that minimum from the 'maximum weight' plan of stenciling, and I would, furthermore, be in favor of modifying such other rules as would hold the car owner responsible for failure under fair usage of cars, so excluded from the 'maximum weight' plan of stenciling, either by amending interchange rule No. 42 for steel and steel underframe cars, or by increasing the combinations now in force for wooden cars. I am not at all convinced that it will be necessary to adopt this course, but should it be found necessary to do so, this discussion will at least have served a good end, possibly will result in being a greater boom to the railways than the adoption of the 'maximum weight' stenciling which promised to increase the net tonnage per unit of equipment.

"There seems to be a misunderstanding on the part of some of the members of the association in connection with this discussion. It appears that this 'maximum weight' stenciling is thought to be something new, something which has been recently brought before the association, but on the contrary, it should be noted that the association approved of this method of stenciling 6 years ago. The matter was brought up at last year's convention as it was thought that sufficient time had elapsed in which car owners could get their cars equipped with the axles prescribed in interchange rule No. 66. Now that further objections have been raised to this plan, I believe it will serve a good and useful purpose to institute an investigation in regard to car bodies, etc., and have recommendations made to this association in regard thereto in order to permanently dispose of this subject."

Mr. Seley's motion was then carried.

CONCLUDING EXERCISES.

The Secretary presented the report of the committee on correspondence and resolutions, as follows:

The committee would recommend that the appreciative thanks of the association be extended to President Stewart for his excellent address and the splendid manner in which he has conducted the proceedings of this convention; to the officers in general for duties well done in handling the many details in connection with our convention; to the various committees that have considered and reported on the various subjects assigned to them; to the committee on arrangements for its effective service in making such complete plans for the meeting; to the railways for courtesies extended; to the hotel men of Atlantic City for their hospitality; to the Railway Supply Manufacturers Association for the complete exhibition of railway appliances; to the technical press generally, and to the RAILWAY AGE GAZETTE, especially, for the daily reports of all the features of the convention.

C. A. Seley (C. R. I. & P.): I would like to suggest an addition. The coupler committee report suggests a vote of thanks to the various railways for courtesies extended them. I believe the thanks of the association are due to all the railways who have contributed in any way, either by material or otherwise, to the work of the coupler committee. That committee has traveled thousands of miles, put in a good deal of time and had expenses which were assumed in large part by their own roads. I therefore suggest that the resolution of thanks include the tender of thanks of the association to all railways participating in supplying material or otherwise to the coupler committee's work.

The motion with Mr. Seley's amendment was carried.

M. K. Barnum (Ill. Cent.): I would like to move a vote of appreciation of the faithful and efficient service of our secretary during the past year. I feel confident in saying that the good order and promptness with which our business has been transacted is very largely due to his efficiency and ability in handling our work.

J. J. Hennessey (C. M. & St. P.): In seconding that motion I want to say that the arbitration committee has probably had more connection with the secretary than anyone else, and he has responded to every call we made upon him, been always prompt on time, and I think the association owes the secretary very much appreciation.

The motion is carried unanimously.

The Secretary: Mr. President and Gentlemen, I certainly appreciate this compliment to me, but I would like to say to you gentlemen that it is a pleasure, and I might say my life work to serve this honorable body. I think it is the grandest institution of the kind in the world.

While waiting for the report of the tellers the following discussion took place.

C. D. Young (Penna. Lines): In the working of the specifications as to truck sides and bolsters, it was brought to my attention that there was no general form or style in our specifications for the association, and it seems to me the time has come when all the valuable specifications we have should be reviewed by some committee under some certain form, so you will know where to look for a particular specification if you want it. It is difficult to determine what is the rejection limit in certain of the requirements, and I would like to make a motion that a committee be appointed, of which the secretary of the association should be a member, to go over all the specifications of the society, and, without changing the form or substance in any way, revise them in some order of form and style. I might say the American Society for Testing Materials found themselves in a similar position this year, and they have found it a valuable thing to have such a committee, and I suggest that this matter be referred to the executive committee for the appointment of such committee.

The Secretary: I think Mr. Young's suggestion is a very good one, and as that will be a part of the records of the meeting, it will be referred to the executive committee.

E. W. Pratt (C. & N. W.): It seems to me that the committee on truck side frames ought to include specifications, or at least limiting strains per square inch, of the arch bar trucks. I do not see why we should be so critical of other styles, and accept everything that is passed to us in arch bar trucks, when we know the failure in that respect is considerable. If we are going to get up a specification and live up to it, and decline to receive cars that are loaded beyond what the public considers safe for a steel side frame, why should we pass over arch bar trucks?

The Secretary: That suggestion will be referred to the executive committee. You will help out the executive committee a great deal by just such suggestions as these you are making now.

E. A. Miller (N. Y. C. & St. L.): The severe weather of the past Winter has very clearly demonstrated that much trouble has been brought about by the weakness of the arch bar truck. Many cars, as we all know, are still equipped with the arch bar truck. This is a matter that can very properly receive careful attention from this association. Another matter that with us has developed an unusual trouble during the past winter is the dropping of brake beams. There was a general discussion here on brake beams, the brake beam head and the brake beam shoe, but the construction of the brake beam is something that should receive very careful attention from the fact that not only on our own road, but from reports on other roads they had very serious trouble and that trouble has steadily increased. I think that is due to a number of causes. The general trend of the operating department is to carry the trains over the road, to spend but very little time on inspection at intermediate points or terminals, so that the little defects that crop out, such as the losing of cutter keys, the losing of bolts and those minor things in the travel of a car several hundred miles bring about these defects of inspection. So, altogether, I think we are losing for the lack of more careful inspection, especially on running repairs of loaded cars and the dropping of brake beams. On our own road there were more than 50 brake beams dropped during the months of February and March, and those brake-beams were not from any one company's cars, but practically from every company's cars that were doing business over our line.

J. F. DeVoy (C. M. & St. P.): I had personal charge of a track that had been below zero weather for 40 to 50 days, and within one mile of track, I have seen track heaved out of level 11 in. It was that condition more than anything that pounded out your trucks, that caused hot boxes by the severe pounding of waste and dropping it away from the axle; and I say for at least 4 months there was no known method of preventing 50 per cent. of the failures you have referred to. I go further and say, whether the traffic department or the car men or any other department be censured or not, nothing could have prevented them. The minute the cold weather left us and the track began to resume its normal condition, the accidents and the failures fell off, and I believe everybody will agree with me that when the weather does not interfere, you do not hear of anywhere as near as much failure as that trouble you speak of. I have seen new tires broken from nothing but severe weather; tires that would have lasted two or three terms, and that would not have failed under ordinary conditions.

F. W. Brazier (N. Y. C.): I would like to emphasize what the gentleman said, and I think a great deal of Mr. Miller's trouble is in the construction of the cars; in addition to the hangers, there should be some form of safety strap or safety chain. We have had the same trouble.

Mr. Schroyer: Many complaints came in to me during this past winter of nuts working loose, and I knew it was the hard condition of the track that was causing the trouble. Now, as to the arch bar truck—there was never iron put together that would stand as much as the arch bar truck, and yet I believe after we have reached a certain capacity of a car with an arch bar truck, that we have gone beyond the capacity of the iron to withstand the strain, and we have to go to some other construction. Now, we use a good many steel trucks on the Northwestern with a great deal of satisfaction, and yet, after long continued use and under like conditions, and under the same percentage of heavy load that the arch bar trucks have been carrying so many years, I think we have got to give the palm to the arch bar trucks until we go to something else.

The following officers were elected: President, C. F. Fuller, Union Pacific; vice-presidents, M. K. Barnum, Illinois Central; D. F. Crawford, Pennsylvania, and D. R. MacBain, Lake Shore and Michigan Southern; treasurer, John S. Lentz, Lehigh Valley. Executive Committee: R. E. Smith, Atlantic Coast Line; C. E. Chambers, Central of New Jersey, and Henry LaRue, Chicago, Rock Island and Pacific.

President Stewart was presented with an ex-president's badge and the Convention adjourned.

A railway is projected in southern Russia to connect the town of Akerman with that of Leipzig on the Southwestern railway, the distance being about 100 miles, and to cost $3,090,000. This line, if carried through, will be of great benefit to the province of Bessarabia.

M. C. B. REGISTRATION.

Cox, W. N., Supt. Mach., Western Ry. of Ala. & Atlanta & West Point R. R.
Dunn, J. F., S. M. P. & M., Oregon Short Line R. R., Chalfonte.
Endsley, Prof. L. E., Purdue University.
Ewing, J. J., Ches. & Ohio Ry., Holbrook.
Kapp, W. F., S. S. & M., R. F. & P. Ry., Marlborough-Blenheim
Manchester, H. C., S. M. P., Dela., Lack. & Western R. R., Marlborough-Blenheim.
Schlafge, Wm., Gen'l Mech. Supt., Erie R. R.
Schnepel, J. H., Chief Draftsman, N. Y. C. & H. R. R. R.
Westervelt, Jos., M. C. B., Retired, N. Y. C. & H. R. R. R.

M. C. B. GUESTS.

Andrews, D., B. & O., Lexington.
Beale, G. M., B. & O.
Beaumont, C. A. Elwood.
Bently, H. T., Chicago & N. W., Marlborough-Blenheim.
Bickley, H. E., Cumberland Valley R. R., Chalfonte.
Billan, Lewis S., B. & O. R. R., Arlington.
Borup, O. V., B. & O. R. R., Kenderton.
Boyer, W. P., Penna. R. R., Elwood.
Braucher, P. S., P. & R., Seaside.
Burton, G. H., P. R. R., Chalfonte.
Burton, W. C., Penna. R. R.
Butts, H. M., N. Y. C., Chalfonte.
Chase, E. P., Pa. R. R.
Cromwell, J. E., B. & O., Kenderton.
Dailey, E. B., U. P. R. R., Traymore.
Dare, John., P. R. R., Roxborough.
Davidson, Wm. W., P. R. R., Wittil.
Davies, H. W., Norfolk Southern R. R., Traymore.
Demorest, George L., C. R. R. of N. J., Dunlop.
Deyot, F., N. Y. C. & H. R. R., Ben Hur.
Dobson, J. D., B. & O., Bouvier.
Engard, Capt. Albert C., U. S. Navy, Bothwell.
Ensign, J. F., (U. S. Gov.) Int. Commerce, Marlborough-Blenheim.
Erb, C. W., P. R. R., Marlborough-Blenheim.
Fleming, Joseph M., P. R. R., Maryland.
Force, H. J., D. L. & W., Chalfonte.
Foster, C. G., P. R. R., Roxborough.
Freeman, L. H., B. & O. R. R., Kenderton.
Fritch, L. C., Chgo. Great Western, Chalfonte.
Germar, Rodolph, Austrian Society of Credit for Land Mortgages, Seaside.
Glass, J. C., P. R. R., 21 Illinois Ave.
Glass, J. C., Jr.
Haig, J. F., Penna. R. R.
Haynes, J. W., Cornwall & Lebanon R. R., Jackson.
Hays, J. L., B. & O., Arlington.
Hebrank, M. M., P. R. R., Biscane.
Hengstler, D., P. R. R.
Herrera, A., National Rys. of Mexico, Traymore.
Hill, J. P., P. R. R., Marlborough-Blenheim.
Holst, William A., Union Tank Line Co., Young's.
Hughes, S. W., The Washington Terminal Co., Craig Hall.
Ingersoll, G. R., Lake Shore, Shelburne.
Johnson, R. E., Canadian Pacific Ry., Young's.
Josias, Herman, Cuba R. R., Shelburne.
Killian, W. J., P. R. R.
Kniter, G. G., P. R. R., Maryland.
LeCompte, J. V., B. & O. R. R., Lexington.
Lentz, Robert P., Lehigh Valley, Dennis.
Lewis, M. N., Oklahoma Central Ry.
Little, D. A., P. R. R., Dunlop.
Lively, B. F., South Ry.
Lowmann, H. F., Southern Ry., Traymore.
Macklin, H. C., Seaboard Air Line, Haddon Hall.
Macklin, Harold H., Seaboard Air Line Haddon Hall.
Marshall, C. V., Sr., P. R. R., New Strathaven.
Marshall, C. V., Jr., P. R. R., New Strathaven.
Marshall, T. B., P. R. R., Chelsea Hall.
McFarlane, H. B, A. F. & S. F.
Miller, B. E. D. L. & W. R. R., Young's.
Moriarty, G. A., N. Y., N. H. & H., Arlington.
Myers, T. H., Penna. R. R., Elwood
Parker, C. F., Illinois Central, Marlborough-Blenheim.
Phillippe, B. Pemberton, P. R. R., Shelburne.
Philpot, J., N. Y. C. & H. R. R. Co., Pennhurst.
Porter, C. D., P. R. R., Shelburne.
Powell, James, Grand Trunk, Young's.

Randolph, J. L., B. & O. R. R., Shelburne.
Raquet, E. H., N. Y., W. H. & H., Marlborough-Blenheim
Reusct, H. E., C. R. R. of N. J., Granville.
Robbins, F. S., P. R. R., Haddon Hall.
Robins, J. B., C. R. R. of N. J., Edison.
Rogers, S. M., Elgin, Joilet & Eastern Ry., Marlborough-Blenheim.
Rose, Chas. H., Penna. R. R., Tennessee.
Ryer, F. A., Boston & Albany R. R., Shelburne.
Sandhas, H. L., C. R. R. of N. J., Schlitz.
Schlatter, Louis H., P. R. R., Boscobel.
Sheldon, W. S., N. Y., N. H. & H. R. R., St. James.
Strattan, G. E., P. R. R., Marlborough-Blenheim.
Train, A. H., N. Y. Central, Pierrepont.
Vorback, A. S., B. & O. R. R., Lexington.
White, Geo. D., P. R. R., Marlborough-Blenheim
Whiteman, Harry, Penna. R. R.
Whitsitt, Wm. B., B. & O.
Wight, S. B., New York City, Marlborough-Blenheim.
Wilson, L. M., P. R. R.
Wybel, Wm., National Rys. of Mexico, Traymore.
Young, J., Jr., P. R. R., Craig Hall.

THE CHILLED IRON CAR WHEEL UNDER FIFTY TON CAPACITY FREIGHT CARS.

Chicago, June 5, 1912.

To the Editor of the Railway Gazette:

The purpose of this article is to show, by actual performance records, how well the standard chilled iron car wheel has served under heavy capacity, 50-ton, freight cars.

There have been so many statements made for the purpose of making inroads on the standard chilled iron car wheel business, and particularly with reference to the use of this wheel under cars of heavy capacities, that an actual analysis of a miscellaneous lot of wheels(some of which have been in service six years) will show that this wheel has not only given a satisfactory account of itself, but that the possibilities of future increases in car capacities have no significance, because the chilled iron car wheel will perform equally well under even heavier cars than are in use to-day.

Attention is first called to the development of the freight car from 10 tons to 50 tons. Previous to 1875, the maximum freight car capacity was 10 tons; from 1875 to 1884 it was 25 tons; in 1886, 30 tons; in 1896, 40 tons; from 1901 to the present time, 50 and 55 tons. Comparatively few cars in service are of over 55 tons capacity.

The wheels designed to carry these cars were as follows: 10-ton car, 525-lb. wheel; 25-ton car, 550-lb. wheel; 30-ton car, 600-lb. wheel; 40-ton car, 650-lb. wheel; 50-ton car, 700-lb. wheel.

It was not until the year 1909 that the Master Car Builders' Association changed its standards for 30, 40 and 50-ton capacity cars as follows: For 30-ton capacity car, 625-lb. wheel; for 40-ton capacity car, 675-lb. wheel; for 50-ton capacity car, 725-lb. wheel.

Particular attention is called to this fact, because the wheels that are now being furnished according to the Master Car Builders' Association recognized standard, adopted during 1909, were first applied during 1910. Therefore, the statement which I will submit will be principally for wheels furnished under 50-ton cars prior to 1910, which were the regular 700-lb. wheels. Wheels furnished in 1910 and subsequently thereto weighed 725 lbs.

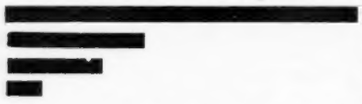
During the rapid development of the freight car from 10 tons to 50 tons, all parts of the car have been increased in weight, and the rail also, but no part of the car or rail has shown such a slight increase as the chilled iron car wheel.

Note the following showing a comparison of the 10-ton capacity cars with cars of 50-ton capacity:

	Per cent. Increase.
Car capacity, increase 10 tons to 50 tons...	400
Weight of axle, increase 350 lbs. to 870 lbs.	149
Weight of rail, increase 50 lbs. to 100 lbs...	100
Weight of wheel, increase 525 lbs. to 725 lbs.	38

The following diagram shows the relative increases in car, axle, rail and wheel:

One-half inch represents 100 per cent. increase.



Note that the standard wheel for 50-ton capacity cars up to the year 1909 weighed 700 lbs., an increase of 33 1-3 per cent.

According to the Interstate Commerce Commission report for the year ended June 30, 1910, there were in service about 383,000 freight cars of 50 tons capacity, which would represent about 3,000,000 wheels.

Attention is directed to the following statement which represents the performance of about 22 per cent. of all the wheels in service under fifty ton cars. The record of the performance of the balance of the wheels in service is not accessible.

	Shipments.	*Replacements.*	*Per Cent Replaced.*
1906	167,207	2,861	1.7
1907	165,110	1,318	.8
1908	76,117	793	1.0
1909	78,256	890	1.1
1910	105,654	258	.2
1911	84,894	19	..
Total	677,238	6,139	.9

It will be observed that out of a total of 677,238 wheels shipped, there were 6,139 wheels removed which were defective and which the makers were compelled to replace.

An analysis of the replaced wheels shows that replacement was for the following causes:

Worn tread	1,028
Shell out	1,987
Cracked plate	2,197
Seam	531
Broken flange	86
Broken rim	105
Broken	8
Miscellaneous defects	197
Total	6,139

It is well known that the flange of the chilled iron car wheel has not increased proportionately with the balance of the wheel, and this has been because the Master Car Builders' Association have been confined to limits of track clearance. Notwithstanding this, it is interesting to know that the flange failures are comparatively few.

This statement shows total shipments of 677,238 wheels, there having been removed on account of broken flanges, 86 wheels, or one wheel in every 7,875 wheels shipped; and it must be remembered that not every broken flange is due to an inherent defect in the wheel, because there may be many contributing factors over which the makers have absolutely no control, as in the cases of defective frogs, crossings and rail. Furthermore, faulty inspection may be a contributing factor, as sometimes a wheel may be allowed to wear too much before being removed; the strength of the flange is consequently decreased. Furthermore, it must be remembered that the flange of the wheel furnished prior to 1910 was not as strong and serviceable as the one now being supplied under the Master Car Builders' Association standard recommended in 1909.

In analyzing the performance of this lot of wheels under 50-ton cars, it must be remembered that all of the wheels are sold under a minimum guarantee time service of four years. The makers will, therefore, have to consider further replacements of wheels sold during the years 1908 to 1911, inclusive, but the wheels sold during 1906 and 1907 have practically fulfilled their guarantee as far as the manufacturers' liability is concerned, and a very large part of those sold during 1906 and 1907 are still in service.

A separate analysis of the wheels sold during the years 1906 and 1907 will give an actual demonstration of the performance of the wheels, and, therefore, attention is directed to the following:

	1906	*1907*
Total shipped	167,207	165,110
Replaced account worn tread	498	233
" " shelled out	1,094	431
" " cracked plate	896	327
" " seam	186	214
" " broken flange	48	21
" " broken	1	2
" " broken rim	31	41
" " miscellaneous defects	107	49
Total replaced	2,861	1,318
Percentage replaced	1.7	.8

While there may have been isolated cases where wheels have not given satisfactory service under some classes of 50-ton cars, the record of the performance of this lot of wheels ought to silence those who question the limitation of the service of the chilled iron car wheel, and, if in the future it may be advisable to increase the capacity of the car still further, the chilled iron car wheel can be relied upon to safely carry loads up to 125 tons capacity.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.
By Geo. W. Lyndon.

SUPERHEATERS AND LOW OPERATING COST.

In the recent reports of railways, the reduction in the cost of transportation in some cases has been sufficient to provoke an investigation of the causes for the decrease. In one case in particular inquiry was made as to the means by which the increased cost of labor employed, in train movement particularly, was partially or wholly offset. This inquiry has brought forth the information that the adoption of superheaters on the locomotives had made possible an increase in capacity per locomotive thus making it practical to haul more cars per train, with a reduced cost per train mile. It has also shown a large saving in engine mileage, brought about not only by the longer trains, but by eliminating the necessity, in many cases, of double-heading.

Individual cases, illustrating the fact that the superheater has reduced the necessity of double-heading, may be found in considerable numbers. With a superheater locomotive it is often possible to handle, in passenger service particularly, from 2 to 4 more cars over the ruling grades than was possible with saturated engines of the same class. The superheater locomotive has, in addition to hauling this greater number of cars, proved itself capable of maintaining a faster schedule with the larger train than the saturated engine could maintain with 3 or 4 cars less.

These facts, together with the continuity of operation of superheater engines, resulting in fewer engine failures, have materially reduced the cost of transportation on roads where the engines are extensively equipped with superheaters.

ELECTION OF EXECUTIVE MEMBERS, SUPPLY ASSOCIATION.

The election yesterday morning for four members of the executive committee of the Railway Supply Manufacturers' Association for the first, second, fourth and seventh districts, each to serve a term of three years, resulted as follows:

First district, Fred. M. Nellis, Westinghouse Air Brake Co., Boston, Mass.

Second district, Oscar F. Ostby, Commercial Acetylene Co., New York.

Fourth district, J. C. Whitridge, Buckeye Steel Castings Co., Columbus, Ohio.

Seventh district, S. M. Dolan, American Car & Foundry Co., St. Louis, Mo.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

The semi-annual meeting of the Association of Railway Electrical Engineers was held at the Hotel Dennis, Atlantic City, June 14, and finished with a one day session. There were about fifty members in attendance. This summer meeting was held at the time of the M. C. B. convention so that the members could hear the report of that association on Train Lighting, hear the discussion and see the exhibits of electrical apparatus relating to train lighting.

The morning session was occupied first with regular routine business, including the address of the president, F. R. Frost (A. T. & S. F.), and the report of the secretary and treasurer, Joseph A. Andreucetti. The Electrical Testing Laboratory of New York sent an invitation to the members to visit it, which was accepted by about half a dozen. The executive committee decided that the next meeting would be held at the Auditorium Hotel, Chicago, October 21-25. The committee reports were preliminary and not complete. They are simply an indication of what may be expected in the reports at the October meeting.

E. J. Cartright, chairman of the Committee of Standards, reported that it is working on standards for ball bearings for the generator axle, for shafts and pulleys, and for lubricants. Nineteen of its recommended standards have been adopted by the M. C. B. Association. A motion was unanimously carried in opposition to clause 12 in the proposed standard of the M. C. B. Association, which will be submitted to their letter ballot. This relates to the fuses in the generator circuit, which are not regarded by the Electrical Engineers' Association as necessary. In the discussion of this report it was pointed out that the dynamo suspension for car lighting is not satisfactory and should be standardized, and the trucks should be designed with special reference to the mounting of the dynamo. Another member reported that steel postal cars were being so designed with deep center sills that only 4½ in. clearance can be obtained between the dynamo and the top rail and the proposed standard provides for 6 in. clearance.

The Committee on Car Illumination will report in October on the lighting of postal cars and on the lighting of railway shops and stations. It will present an elaborate report of about 150 pages on the car lighting practice of the Baltimore & Ohio. The question was raised as to how funds would be provided for the expense of publishing such large reports, and the subject was referred to the executive committee.

J. R. Sloane made a preliminary report on specifications, and said that it was expected to present specifications for rubber belting, for incandescent lamps, and for wire for electric conductors.

F. E. Hutchinson said that the train lighting report would be principally concerned with battery charging and the organization of the men at large terminal stations where this

work is done. The committee had found that for regulator and dynamo inspection two men could inspect 15 cars in a day of 10 hours.

The Committee on Insulation of Wires in Railway Buildings reported progress.

At the afternoon session A. I. Totten, of the General Electric Company, discussed the subject of electric equipment for railway shops and said that the alternating current motors can be adapted to the bulk of the requirements, including cranes and transfer tables, the principal exception being motors for variable speed tools, and at present quite a number of machine tools are built so as to provide sufficient speed changes by gearing without the necessity of a direct current motor. Planers, however, require a direct current motor on account of the necessity of high speed acceleration, and it is not probable that the work can be accomplished by an a. c. motor for some years to come. At the General Electric Works a number of planers are now driven by a reversing motor, and in the exhibit of the Niles-Bement-Pond Company on the pier, there is a planer driven by a reversing motor. It is found that there is an increased output of 25 per cent. due to the use of this type of motor on planers. Mr. Totten referred to the general design of railway shops, and said that they were not always best, as the type of erecting shop was usually due to the personal preference of the superintendent in charge. The Seaboard Air Line shops combine the advantages of the longitudinal and cross track types by the use of a separate shop for removing locomotives from their wheels. This scheme has also been adopted by the Chicago & Northwestern at its new Chicago shops.

The specifications for railway electrical equipment often impose impossible conditions and the requirements should therefore be standardized to some extent. For example, there is no general agreement in regard to the temperature limit and overload for generators, and railway requisitions should follow the recommendations of the American Society of Electrical Engineers. In the power plants for large railway shops the reciprocating engine has become almost obsolete. Turbines are now quite generally used and the total cost of the turbine and generator is less than that of the cross-compound engine and generator. Where the older shops have been equipped with direct current motor and reciprocating engines, in some instances the current for extensions has been provided by the use of exhaust turbine using the waste steam from the reciprocating engine.

Returning to the motor for tools, Mr. Totten said that the automatic stopping and starting of d. c. motors is found necessary on account of the rough usage they get when such fixtures are not provided, and on most new equipment push button control is now used for starting machinery and it is sold at a comparatively low price. For driving wheel lathes the hard spots in the tires often require a rapid change in speed, and devices for accomplishing this electrically are also in use.

In regard to wiring of shops, the general practice now is to use conduits throughout. For shop lighting the carbon arc lamp is now obsolete and present methods employ the flaming arc lamps and the filament lamps. Mr. Totten's suggestion from the manufacturer's point of view was that if equipment is ordered without full knowledge of the latest improvements which the manufacturers provide, only standard equipment will be obtained, and it would be an advantage by possible conference with the manufacturers' engineers to obtain improved equipment which would include the later refinements.

The same subject of electrical shop equipment was also discussed by F. H. Herszsh, of the Westinghouse Electric & Manufacturing Company, who said that it was often a question whether it was best for the railways to put up an expensive power house for generating current or to purchase it from some other central power plant. This would avoid a large investment for the building and equipment, the service would be reliable, and there would be simplicity in the bills for the power supply and the bookkeeping would be easier to check. It would then be easily possible to compare the power consumption with the locomotive output at various times. In car shops the tools required for steel cars are usually of variable speed and require direct current motors, and this is true to the extent of 40 to 50 per cent. of the total power consumption.

The numerous advantages of direct driven tools were pointed out. They avoid the loss due to the friction of driven shaft, the elimination of belts and the loss due to their slipping, and numerous other troubles found with belting, especially the accidents to workmen. One of the principal advantages of direct drive is the possibility of checking by a graphic meter in the foreman's office the power required for operating tools and the time when they are in use.

Next followed a discussion on car illumination by A. J. Sweet, of the Holophane Company, who spoke at length in a very interesting and instructive manner. He explained the latest views in regard to illumination as applied to power requirements. He said it was the first duty of the engineer to harmonize different requirements. The three major requirements in car lighting are, first, comfort to the passenger; second, artistic effect, and third, efficiency. Ocular discomfort is due to the vision of the light source, but it is not necessary to entirely envelop the lamp, and a bowl shape reflector is often sufficient. Eye fatigue is due also to vision of light and not necessarily to indirect reflected light. The efficiency of lighting in cars is largely effected by the color of the head lining in the upper deck and on the sides of the car and by the windows and dark color finish generally which absorbs large percentages of light; in fact, in railway cars nearly all the conditions are in the direction of maximum inefficiency. He also made the surprising statement that light walls are unfavorable to eye efficiency. The round upper decks of some steel cars now used in this country are more favorable to good illumination than those with the upper deck. For a time it was thought that indirect lighting would be found a very satisfactory improvement for car lighting, but it is found to be only 25 per cent. efficient, and on account of the limited production of light in cars, it is not now regarded as feasible. It depends largely on clean reflectors, and for proper illumination it would require these reflectors to be cleaned every 500 miles run. The advantage of indirect lighting does not lie in the fact that the source of light is concealed but rather to the multiple direction of the reflection.

The minor requirements of car illumination relate to their advertising value and to maintenance. The maintenance cost is affected largely by the expense for reflectors, and the sockets for these should be such that the reflectors can be easily removed and cleaned, and it might be possible to have duplicate sets of reflectors, so that new sets could be put in while the others are being cleaned.

A second paper on car lighting was read by L. Schepmoes, representative of the Safety Car Heating & Lighting Company. This related to the design and location of car lighting fixtures and was an interesting discussion of the artistic features of lamps. Mr. Schepmoes presented nine handsome photographs showing the latest designs for center lamps made by his company. He said that cheap fixtures should be condemned. The appearance of the lighting fixtures is important in day time as well as at night, and the color of these fixtures is important and should not necessarily be the same as the car interior, but some contrasting color in the fixture should be permitted. Lamp fixtures should be carefully designed on artistic lines and excessive ornaments should be avoided. A question of which is best, to locate the lamps in the center of the main deck or in the lower deck, is one upon which there was not general agreement, but Mr. Schepmoes was in favor of center

lamps. The most attractive fixtures in use are those which use the enclosed bowl. With the indirect lighting many attractive effects from an artistic standpoint can be produced, but it is not an efficient method. The importance of proper shades and reflectors is now greater than formerly, because much stronger illumination is used and the intense glare effects produce a corresponding discomfort. Polished surfaces have a bad effect on illumination and should be avoided where possible.

The next subject discussed was the method of axle generator control, constant current against constant potential. This subject was discussed by representatives of axle car lighting companies, and it was pointed out that in the present state of the art it is not possible to adopt either system, that of constant current or constant voltage regulation, and the attempts to effect operation under either condition would fail. Variable speed is a fortunate thing for charging batteries from axle lighting and it remains for the engineer to take advantage of this fact. It introduces effects which must be provided for and both the battery and the generator should be properly protected. It might be best to regulate for the benefit of the battery, but it might not be most economical for the railway or best for the lighting, so that a compromise under present conditions is necessary. Various schemes have been suggested for apparatus which are intended to regulate upon either of these plans, but they have not yet been fully worked out. At present regulation by voltage was decidedly the simplest method. The further discussion of this subject completed the afternoon session and the meeting adjourned.

MEETING OF M. C. B. EXECUTIVE COMMITTEE.

The executive committee of the Master Car Builders' Association met yesterday after the convention adjourned. Secretary J. W. Taylor was re-elected, and F. W. Brazier (New York Central), was named to succeed E. D. Bronner (Michigan Central), on the arbitration committee, Mr. Bronner having resigned from that committee.

The executive committee decided to meet early in July to appoint the committees for the ensuing year, and an attempt will be made during the next year to get the reports out earlier than in the past.

ILLINOIS ALUMNI DINNER.

The following attended the University of Illinois alumni dinner held last evening at the Hotel Shelburne: Gilbert E. Ryder, Locomotive Superheater Company; J. A. McFarland, Chemist and Engineer of Tests, St. Louis & San Francisco; Grant W. Spear, Dearborn Drug and Chemical Works; F. H. Clark, G. S. M. P., Baltimore & Ohio; C. B. Young, M. E., Chicago, Burlington & Quincy; J. A. Kinkead, Parkesburg Iron Company; J. A. McRae, M. E., Michigan Central; George R. Carr, Dearborn Drug and Chemical Works; R. M. Smith, Burton W. Mudge & Company; Prof. E. C. Schmidt, University of Illinois; W. C. Bradbury, O. M. Edwards Company; Frank W. Bunne, Roebling Company; A. A. Hale, Griffin Wheel Company; A. S. Goble, Standard Steel Works Company; Parker G. Stevens, Railway and Engineering Review.

A line is projected from Soochow, on the Yangtse River, China, to Hangchow, the capital of the Province of Chekiang, a distance of 60 miles.

Surveys have been completed from Wuchow, China, to Konghow, on the proposed line from Wuchow to Nanning. Konghow is very near Nanning. The line when completed will be 360 miles long.

TO-DAY'S BASE BALL GAME.

The annual base ball game will be played at the Pennsylvania Railroad's Inlet Park grounds this afternoon at 3 o'clock. The parade will be formed at the entrance to the Million Dollar Pier at 2 o'clock, and will proceed from there up the Boardwalk to South Carolina avenue, where trolley cars will be taken to the grounds.

The committee in charge of the game is composed of George W. Wildin, manager of the eastern team; F. M. Nellis, manager of the western team; Leonard J. Hibbard, Harry S. Hammond, E. F. Chaffee, George R. Carr and J. P. Landreth.

The mascot of the western team will be Master Charles Gossett, Jr., son of C. E. Gossett, general master mechanic of the Minneapolis & St. Louis, and the mascot for the eastern team will be Master Elliott A. Telford, son of Andrew Telford, purchasing agent of the Queen & Crescent.

The batting orders are as follows:

	EASTERN TEAM.
Right field	Clifford Beaumont (B. & O.).
Short stop	Leonard J. Hibbard (L. J. Hibbard Co.).
First base	George W. Wildin (N. Y., N. H. & H.).
Second base	T. P. O'Brian (O. M. Edwards Co.).
Left field	Al Engle (Jenkins Bros.).
Third base	Sheldon C. Potter (Reliance Electric & Engineering Co.).
Center field	Melon C. M. Hatch (D. L. & W.).
Catcher	Arthur W. Byron (P. R. R.).
Catcher	Harry Oviatt (N. Y., N. H. & H.).
Catcher	John Randolph (Franklin Railway Supply Co.).
Pitcher	Harry Bradford (Westinghouse Air Brake Co.).
Pitcher	Harry B. Oatley (Locomotive Superheater Co.).
	WESTERN TEAM.
Short stop	J. E. Tarleton (Union Draft Gear Co.).
Second base	Stanley W. Midgley (Curtain Supply Co.).
Center field	Neil W. Snow (Detroit Twist Drill Co.).
Pitcher	Elmer J. Smith (W. C. Baker Car Heater Co.).
Catcher (or c. f.)	Harry S. Hammond (Pressed Steel Car Co.).
First base	C. L. Schwartz (St. Louis Refrigerator Car Co.)
Right field	H. C. May (C. I. & L.).
Catcher (or l. f.)	A. J. Odegaard (Spencer Otis Co.).
Left field (or c.)	J. H. McCloy (Zug Iron & Steel Co.).
Third base	J. E. Fleming (National Tube Co.).
Catcher	R. L. McIntosh (McCord & Co.).
Left field	E. B. Van Patten (Murphy Varnish Co.).

The umpires will be: W. E. Cade (Frank A. Barbey Co.), for the East, and George Cooper (Frost Railway Supply Co.) for the West.

T. D. O'Brian will be captain of the eastern team and Harry Hammond of the western team. Our sporting editor interviewed the rival leaders yesterday, and found each in a mood of the most buoyant optimism regarding the merits

of his own aggregation, and of corresponding contempt for the opposition.

Quoth—

Captain O'Brian—I figure the game will go about five innings, although the West may blow up even sooner than that. I have had some trouble holding my men since they saw the line up of the other team; they protest that they signed up to play ball, not to teach the rudiments of it to such unpromising material. But I have persuaded them to come out and act just as if they were playing against nine real ball players. I am particularly anxious to make it look like a regular game, instead of warming up practice. For this reason I shall make it a point to have nine men on the field each inning, instead of using only an infield.

Captain Hammond—I have done my best, by spreading reports of our need of players, to instill enough confidence into the eastern team to insure their coming out to the field, at least. It is now no secret that I have had for months the finest aggregation of ball players ever gathered on this or any other planet. This is a conservative statement, and I make it only after a painstaking study of the history of the game. Their experience in many climes and under all conditions of service is a guarantee of their ability to continue in action under the most trying circumstances. Even though convulsed with merriment at the efforts of the opposing team, they will still play ball.

FOREIGN RAILWAY NOTES.

Construction work will be pushed forward rapidly on the line from Chengtu, China, to Chungkiang, 200 miles. This line will form a portion of the proposed Hankow-Szechwan system

One of the chief features of the present railway policy of the Chinese government seems to be the disposition to take over all railway enterprises which have been undertaken by private capital, but which have been unduly delayed in execution. For example, the recent troubles in the Chekiang railway led the government to step in and announce that it would take over the entire enterprise. The company is reported to have sent a representative to Peking to change the determination of the government, but at last accounts the latter was adhering to its decision. Similar action has been taken in a number of cases, and it has been announced by the board of communications at Peking that all railway-building privileges granted to private interests must be put into operation during the present year or the government will take them over. However, the Chinese gentrymen interested in building roads with Chinese capital find it difficult to raise the money. Unfortunately, the fact that some of the railways already in operation have been ill managed or have been operated under conditions that render it impracticable to secure fair returns on the Chinese capital invested in them is a constant discouragement. That present conditions in the railway situation of China can continue indefinitely is impossible. The pressure from the people in favor of railway construction, taking the country as a whole, is growing. The demands of trade in the interior are becoming more pronounced in favor of rapid, safer, and better communication. Throughout China, particularly in the districts accessible to coast ports, improved means of communication are being brought into use, such as motor and steam boat services on the rivers and canals, and in some localities improved roads and automobile service. These improvements are accentuating the need and the advantage of railways, and public sentiment is slowly but surely preparing for great railway development.—*George E. Anderson, American Consul General at Hongkong.*

Conventionalities.

"Senator" Brazier! How unkind, and to an ex-president.

If in doubt as to the proper way to oil a wheelbarrow, ask Stanley Bullard.

F. M. Egolf, of the Curtain Supply Company, is attending his first convention.

Herman Josias, purchasing agent of the Cuba Railroad, is attending the convention. He is registered at the Shelburne.

The Davis brothers are more famous than they were a year ago; and the best part of it is that they use their own ladder to get there.

The enforced separation of Wilkinson and Jack Turner is really pitiful. Everything possible has been done to pacify "Wilk," but without result.

A. Herrera, purchasing agent of the National Railways of Mexico, is at the Traymore. Mr. Herrera is accompanied by his assistant, William Wybel.

Mr. and Mrs. Burton W. Mudge and Master Burton Mudge, or "Junior," as he is familiarly known, arrived from Chicago Thursday evening, going to the Brighton.

George C. Jerome, president of the Jerome Metallic Packing Company, is confined to his home by illness. He had made all arrangements to attend the conventions.

Miss Nancy Jane Simpson, daughter of William M. Simpson, president of the Railway Materials Company, was married Tuesday evening in Chicago, to Clifford Potter.

Mr. and Mrs. R. J. Evans will be missed during the remainder of the convention. They were unexpectedly called home owing to the serious illness of Mrs. Evans' father.

Grafton Dodd, of the Virginia Equipment Company, was taken with an acute attack of tonsilitis on Wednesday and was compelled to leave for home at once.

D. A. Wightman, formerly manager of the Pittsburgh Locomotive Works, now retired, is among the guests at the convention. He is stopping at the Shelburne.

J. T. Ensign, chief inspector railroad department Interstate Commerce Commission, is attending the meetings of the associations. He is at the Monticello Hotel.

Robert F. Carr, president of the Dearborn Drug & Chemical Works, was compelled to cancel his Atlantic City reservations on account of unforeseen business matters.

We move that the nominations for president and vice-president of the Railway Supply Manufacturers' Association be closed, and that Messrs. Allen and Hegeman be declared elected unanimously.

Admirers of the "Turkey Trot," "Texas Tommy," the "Kangaroo Glide" and other modern classics, will be completely carried away with Stanley Bullard's "Boardwalk Wiggle."

A. E. Ostrander, assistant mechanical engineer of the American Car & Foundry Company, arrived Thursday with Mrs. Ostrander and their two children. They stayed only the M. C. B. convention.

Friends of O. C. Cromwell, mechanical engineer of the Baltimore & Ohio, are glad to see him about again. A bad case of ptomaine poisoning confined him to his home for several weeks this spring. He is now fully recovered.

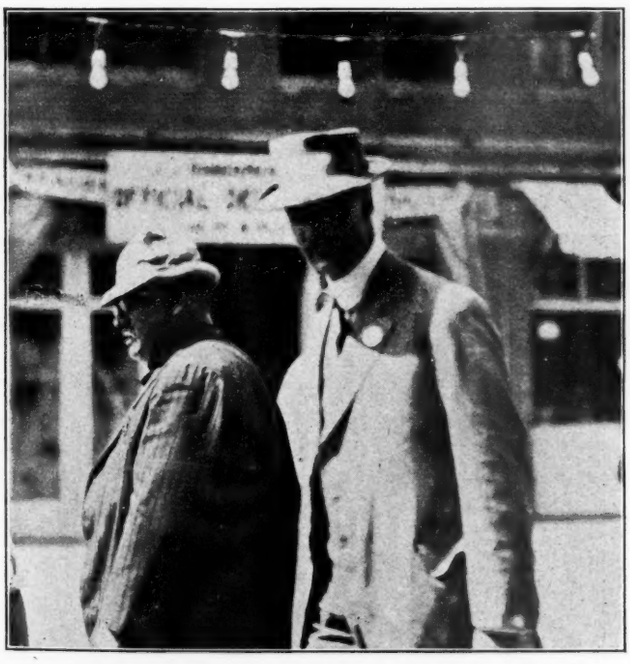
F. W. Brazier talks "turkey trot." He frankly admits that official stenographers generally find trouble in taking down his remarks. After reading in Friday's DAILY what was credited to him on Thursday, he has promised to try to reform.

W. M. Barrett, president of the Adams Express Company, registered at the Marlborough-Blenheim Thursday and attended the meeting of the M. C. B. Association. Later

Wells Harris, General Foreman Car Repairs, New Haven, Fleeing from the Camera Man.

in the day he made a rather complete inspection of the exhibits.

W. W. Clements, of the Industrial Works, is very much interested in these, his first M. C. B. and M. M. conventions. He arrived from Bay City, Mich., Wednesday, and will re-



Left to Right—John L. Hodgson, M. C. B. Grand Trunk, and Alfred Copany, Grand Trunk.

main during next week. Mr. Clements is making his home at the Shelburne.

It is strange how far we can sometimes go wrong in sizing up a man. Most of us received a jolt yesterday when C. A. Scroyer modestly affirmed that he had not only never asked for an increase in salary, but that he never started in on a job knowing just how much compensation he was to receive.

Among the special guests is O. S. Beyer, Jr., of the Chicago, Rock Island & Pacific. Mr. Beyer was formerly on the Erie and had a very active part in the lengthy studies that led up to the design of the very powerful Mikado type locomotives which are giving such excellent service on that road.

C. H. Cory, former master car builder of the Cincinnati, Hamilton & Dayton, at Lima, Ohio, sends his greetings to his friends, through THE DAILY, and his regrets that he will not attend the conventions this year. Mr. Corey and family will enjoy the "good old summer time" in the Wisconsin woods.

J. H. Regan, assistant secretary of the Pressed Steel Car Company, arrived Thursday evening. He is staying at the Marlborough-Blenheim. Mr. Regan usually manages to steal away from the conventions within a day or two after

F. W. Brazier, Superintendent Rolling Stock, New York Central.

getting there; but this year it is expected that he will stay until the last gun is fired.

H. M. Perry, known as one of the oldest of the old timers at the convention, was found in tears at the end of the pier on Thursday afternoon. A careful search of the Dailies revealed the absence of official notice of his arrival two days before, hence the dejection of friend Perry. He is here, was here early, and expects to remain until the convention is over.

Henry Gardner, supervisor of apprentices on the New York Central & Hudson River, came down Thursday afternoon with Mrs. Gardner in order to be sure to be present during the discussion of the apprenticeship paper on Friday. In addition to his regular duties, he has been busy during the past few months in putting in a successful schedule at the West Albany shops.

J. D. Murray, from Christmas Island—13,000 miles from Atlantic City—left last night for Winnipeg. He expects to meet his brother-in-law, George McMicken, who has been on Christmas Island for five years, and will go to London with him in July. Mr. Murray will complete a railway 8 or 10 miles long on the island within the next year, and will equip it with a couple of Shay locomotives and 30-ton steel freight cars.

H. T. Bentley, assistant superintendent of motive power of the Chicago & North Western and president of the Master Mechanics' Association, arrived yesterday, accompanied by Mrs. Bentley. Mr. and Mrs. Bentley are at the Marlborough Blenheim. Important business at home kept Mr. Bentley from attending the convention of the M. C. B. association except on the last day.

W. E. Dunham, of the North Western, and Henry La Rue, of the Rock Island, got into quite a heated discussion Thursday evening about the action which was taken on one of the reports that was read on Wednesday. Fortunately a copy of Thursday's DAILY was near at hand, which settled the matter conclusively; and they both shook hands and called the fight off.

When the baseball game ends to-day Stanley Midgly (in his ball uniform "Midge") will have played at the conventions ten consecutive years, in three of which he was captain of the winning Western team. He has played two years at Saratoga, one at Manhattan Beach, and six at Atlantic City;

Left to Right—F. R. Frost, Electrical Engineer, Santa Fe; F. E. Hutchison, Chief Electrician, C. R. I. & P.; Jos. A. Andreucetti, Assistant Electrical Engineer, C. & N. W.

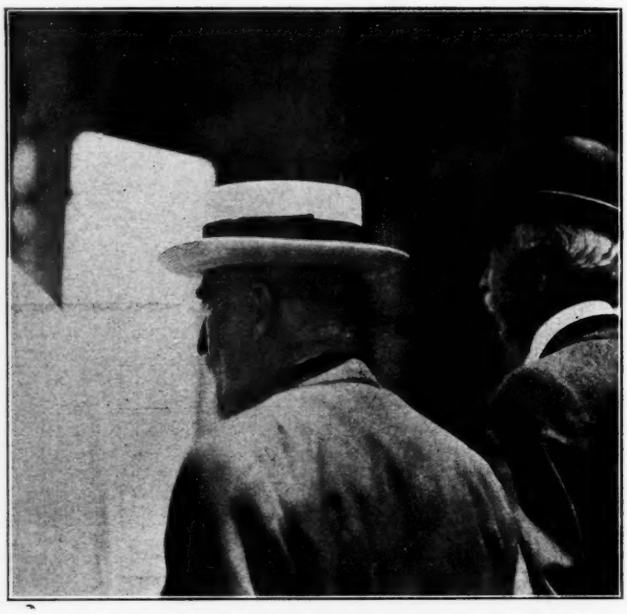
and the indications are that he will keep right on playing as long as the game lasts.

Rodolph Germar, a mechanical engineer connected with the Ringhoffer Car Building Company, Prague, Austria, is attending the convention after a month's trip spent in visiting car building plants in the United States. The company in which Mr. Germar is interested turns out about 3,000 freight and 400 passenger coaches a year. The Ringhoffer works are now running to their full capacity for the first time in several years.

D. P. Kellogg, superintendent of shops on the Southern Pacific at Los Angeles, Cal., is attending the convention for the first time. He came by way of New Orleans and St. Louis and it took him a full week to travel the 4,000 miles. Friends of the two brothers are commenting on the close resemblance in appearance, the most notable difference being that W. L. Kellogg, superintendent of motive power of the Pere Marquette, has a mustache.

C. W. Cross, superintendent of apprentices of the New York Central Lines West of Buffalo, was missed in the discussion of the paper on car department apprentices yesterday. He was prevented from attending the convention because of the illness of one of his sons, which made an operation necessary. The young man is said to be well on the way to recovery. Mr. Cross expects to make a trip to Yellow Stone Park shortly after the season opens.

Clarence Parker, vice-president of the Illinois Central, in



Two of the Old Guard—John S. Lentz, M. C. B. President, 1895 and 1896, and J. J. Hennessey, M. C. B. President, 1902.

charge of purchasers, accompanied by M. K. Barnum, general superintendent of motive power of the same road, made a thorough inspection of the exhibits yesterday morning. Mr. Parker is stopping at the Marlborough-Blenheim and will remain

J. F. Walsh, S. M. P., Chesapeake & Ohio.

several days. The Illinois Central will build 50 Mikado, 20 Pacific and 10 switching locomotives, to be followed by 15 Mikado locomotives for the Central of Georgia.

G. Edmund Strattan arrived Friday and is receiving the congratulations from his friends on his recent promotion to the position of inspector of passenger equipment of the Pennsylvania, with headquarters in the office of the superintendent of passenger transportation, Philadelphia. Mr. Strattan is the son of G. W. Strattan, formerly master mechanic of the Pennsylvania at Altoona. Mr G. W. Strattan, who retired six years ago, arrived in San Francisco June 3, completing a trip around the world.

Fourteen thousand miles of travel to attend the M. C. B. and M. M. conventions is the record, and one that will probably stand for some time. Two natives of Japan have made the journey to Atlantic City and will remain through both conventions. They are Mr. Osawa, mechanical engineer of the South Manchuria Railway. and Mr. Minowa, manager of Mitsui & Company, Ltd., Darien. They attended the convention meetings accompanied by Arthur Haller and Charles Muchnic, of the American Locomotive Company, and Mr. Tesheima, of the railway department of Mitsui & Company, Ltd., New York office.

The following telegram from the superintendent of motive power of the Grand Rapids & Indiana was received by Mr. Gardner in due course yesterday morning and, likewise, in due course, was charged to Mr. Gardner's account with the hotel:

Grand Rapids, Mich., June 13-12.

J. T. Gardner, Marlborough Blenheim, Atlantic City, N. J.:
Refuse to start without protection is promised from Riley, Arp, McCarthy and the other porch climbers. Providing these people are driven from the island, I will come on at once. Buhuoup and McCandless are included in list.

J. E. Keegan.
3:35 A. M."

The question is, where was Keegan at 3.35 A. M.?

L. C. Fritch, chief engineer of the Chicago Great Western, accompanied by Mrs. Fritch, is at Chalfonte. Mr. Fritch came here to attend a meeting of the engineering sub-committee of the Special Committee on Relations of Railway Operation to Legislation. He is chairman of the sub-committee, and the other members are George W. Kittredge, chief engineer of the New York Central; W. L. Darling, chief engineer of the Northern Pacific; and C. A. Morse, chief engineer of the Santa Fe System. The meeting, which was held at Chalfonte at 10 o'clock yesterday morning, was called for work on a report on the rail situation which the sub-committee is preparing for the special committee. Senator Clapp, chairman of the United States Senate Committee on Interstate Commerce, was asked for information as to the number and causes of rail failures and breakages in 1911, and the special committee has been instructed by the railways it represents to furnish the desired data.

S. P. Bush, president of the Buckeye Steel Castings Company, is among the convention visitors. Mr. Bush recently has been taking much interest in the question of federal legislation to permit reasonable agreements between competing railways in regard to rates and competing industrial concerns in regard to prices, and which will also clear up the legal status of labor organizations. He was a witness before a congressional committee that held hearings on the subject a short time ago, and subsequently issued a pamphlet outlining his views. He is a firm believer in, and a vigorous, able advocate of some form of legislation that will legalize agreements which will eliminate cut-throat competition and at the same time be hedged about by restrictions which will amply protect the public against monopoly and its attendant evils. If more business men of Mr. Bush's standing would take the active and intelligent interest that he does in public questions of this kind, instead of leaving them to be dealt with so largely by lawyers and politicians, the results in the long run would be much happier both for business interests and the public interests.

The Exhibit.

The safe ends used by the Oxweld Acetylene Company in its demonstration of flue welding in the acetylene annex at the pier end are genuine charcoal iron supplied by the Parkesburg Iron Company, Parkesburg, Pa.

During the past year large additions have been made to the plant of the Haskell & Barker Car Company at Michigan City, Ind. The additions consist of truck and erecting shops with steel frames and traveling cranes suitable for the construction of steel freight cars; also a new power house with electric generator for light and power transmission. The plant now occupies 150 acres and when in full operation will have a capacity of 100 cars per day. The older shops are well equipped for making wheels, axles and forgings, so that the plant produces all the details necessary for freight car construction excepting couplers, air brakes and springs.

The Edison-Beach storage battery car will be in regular operation, leaving Boardwalk and South Carolina avenue daily, at 10 a. m. and 3 p. m., for Ocean City and return. The car is in charge of R. H. Beach, president, and Le Roy Scott. Special trips may be arranged for those visitors to the convention who desire to make a special study of the car, if they will apply at booth 627 on the pier. The car arrived in Atlantic City Thursday, from Silver Lake, N. J., 175 miles, and made an average speed of 32 miles an hour. The current consumption was 460 ampere hours for the entire trip. This is equivalent to 663 watt hours per car mile, or 33 watt hours per ton mile.

The seamless tube is regarded as necessary for superheater elements, and most of those used heretofore have been cold drawn. The operation of drawing tubes cold is so slow that the product is necessarily more expensive than is that of hot drawn tubes. The principal requirement is, that the tube shall be seamless; and a hot drawn seamless tube should answer all purposes and it can be made much more rapidly. For these reasons the National Tube Company, Pittsburgh, Pa., is now making hot drawn seamless tubes for locomotive superheaters, and they have on exhibition a lot of samples of finished tubes and of pieces which have been severely tested to show the good qualities of this product.

Two trucks, with a new design of cast steel side frames are being shown in the booth of the Scullin-Gallagher Iron & Steel Company, Spaces 153-159. The top half of the journal box is cast integral with the side frame, which gives a truck with a minimum number of parts and from which the bolster or wheels can be quickly and easily removed anywhere, without dismantling the truck. One truck also shows a new method of construction in that the spring plank and column guides are made in one solid steel casting, giving a very rigid truck. There are also on exhibition cast steel truck bolsters, a cast steel double body bolster, a one-piece cast steel six-wheel passenger car truck frame and the Durbin safety coupler.

GOLD THERMOSTAT FOR CAR HEATING.

The Gold Car Heating & Lighting Company, New York, is exhibiting a very simple thermostat for railway car heating. It consists of a hydrostatic transmission of the motion produced by the evaporation and condensation of an exceedingly volatile liquid to the cut-off valve in the supply pipe. The volatile liquid, which is very sensitive to slight changes of temperature, is enclosed hermetically in a narrow space between two corrugated discs. One of these is rigid and

the other flexible, moving in and out according as the pressure, generated by the volatile liquid, rises or falls with the temperature inside the car. The movable disc bears, at its center, against one end of a lever whose other end presses on the center of a smaller disc forming one side of a small hermetically sealed circular chamber, which is filled with a non-freezing liquid. This space is connected with a similar one, whose movable disc has a bearing against the stem of the cut-off valve; and as the liquid flows from one to the other, the valve is opened or closed.

The method of operation is as follows: The thermostatic disc chamber is adjusted by means of a screw so that the movable disc bears with more or less pressure against the transmission lever. This is to adjust the apparatus to maintain the desired temperature in the car. As this temperature rises, the liquid in the regulating disc is volatilized and increases the pressure within. This pushes out the movable disc and, acting on the lever, compresses the disc of the hydrostatic chamber and causes the non-freezing liquid to flow through the small pipe connection to the chamber whose movable disc operates the cut-off valve, causing the latter to close.

As the temperature falls, the volatile liquid is partially condensed, the pressure within the regulating disc falls; the non-freezing liquid is forced back to its original position by the spring tension of the hydrostatic chambers, and the cut-off valve is again opened, admitting steam to the supply pipes of the car.

It is the intention to place one of these thermostats on each side of the car so as to secure an independent regulation, and thus tend to equalize the temperature.

This device is absolutely automatic in its regulation of heat and requires no attention whatever from trainmen.

STEEL COACH INTERIOR FINISH.

The advance in the art of steel coach interior finish is shown markedly in the booth of the Hale & Kilburn Company, Philadelphia, Pa. Among other things, they are exhibiting a finished section of a car now in use on the New York Central Lines, which has the new feature of adjustability, combined with perfect insulation. The recent improvements in metal sash having screwless and interlocking metal beading is also to be found, as well as the latest development in steel coach doors represented in various types, so finished as to be indistinguishable from wood. Various types of the imperial steel frame "Walkover" car seats are shown, including the special standard seats of the Pennsylvania Railroad, Harriman Lines, New York Central, and New York, New Haven & Hartford Systems.

OIL ENGINES FOR WATER STATIONS.

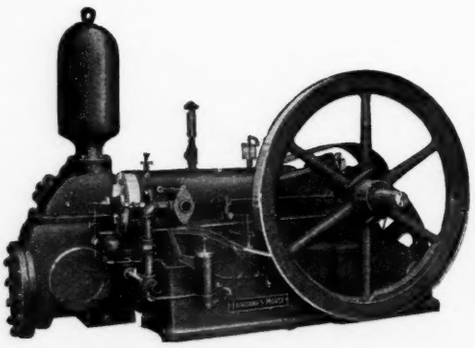
The great economy of engines operating on oil for water station service is illustrated by the following data regarding a short running test made with a 10 h. p. Fairbanks-Morse combined pumping outfit.

No. hours run	7.5
Gal. of water pumped	118,076.5
Water pressure, lbs.	60.
Equivalent head-feet	138.
Gal. of oil used, total	9.989
Gal. of oil used per M. gal. water	.0846
Gal. of oil used per hour	1.332
Gal. of oil used per BHP per hr.	.1332
Cost of oil per hr.	0.0333
Gal. of water pumped per hr.	15,743.5
Gal. of water pumped per min.	262.4
Gal. of water pumped for one cent's worth of fuel	4,727.6
Cost of fuel per gal.	$ .025
Fuel cost per 100,000 gal. pumped	$ .2115

The gasoline engine has demonstrated in many instances that it can easily hold its own with a steam pumping plant even where the cost of fuel for operating the steam plant is quite low. This is largely due to the advantage the gasoline outfit has in the matter of attendance. With the reduction in fuel cost in the case of an oil engine over the gasoline engine, the steam plant is even more heavily handicapped.

Attendance cost with the steam plant must always be heavy, as compared to the plant operating on oil, since the latter is entirely automatic in operation after being started. The waste of fuel in getting up steam, plus the loss after the plant is shut down, also figures against the steam plant. The chief feature is, of course, the very low efficiency of the small steam plant, and unless the fuel cost is very low, this item alone makes its operation costly.

The initial cost of an oil operated combined pump will as a rule, be less than that of a steam plant of equal capacity, and its compactness will make the matter of installation less expensive. From the standpoint of depreciation, figures will in the majority of cases, favor the oil outfit as, with reasonable attention, the yearly cost of repairs, etc., will be small.



Fairbanks-Morse Combined Oil Engine and Pump.

A point that strongly favors the type of engine illustrated is its ability to operate successfully and develop full rated power on nearly 70 per cent. of the refined products of crude oil. This covers fuels ranging from gasoline down through kerosene and into the low grade power distillates.

The fact of greatest significance to the railway man in connection with oil engine operation is the constantly increasing demand for the lighter oils for automobiles, marine engines, etc., which means a constantly increasing production of the lower grade and cheaper oils.

BRASS SASH FOR PASSENGER CARS.

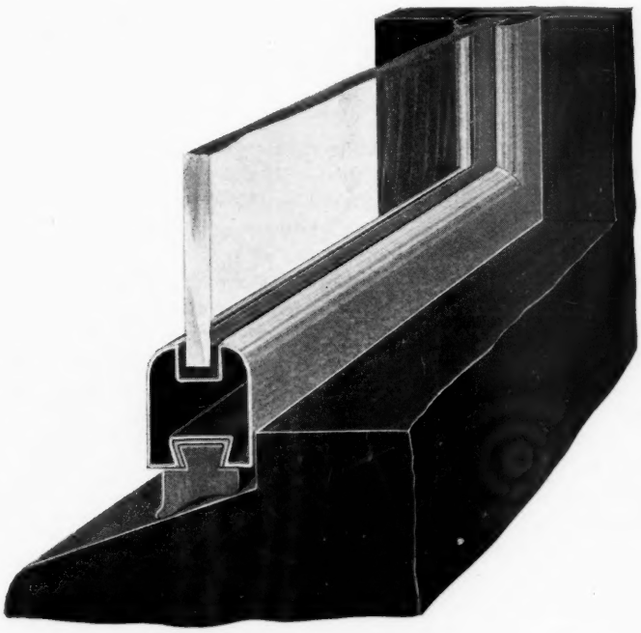
Detailed and accurate figures have been obtained from various railway systems covering the initial cost, together with that of maintenance and replacement, of wooden sash in passenger cars. It was found that during the life of the car, three sets of wooden sash were required, the first sash needed replacing somewhere between the eighth and twelfth year.

At the end of the first year the wooden sash requires only light repairs, including cleaning, revarnishing, reapplying and adjusting in the car. These repairs for the first year run over $25 a car. At the end of the second year the sash are subjected to a general overhauling, including cleaning and revarnishing, the expense amounting to about $50 a car. For five or six years the figures will average from $40 to $65, at the end of which time the sash will have greatly deteriorated and require extensive repairs, including

replacing of parts. These heavier repairs range from $65 to $100. The replacement of the wooden sash at the end of approximately ten-year periods will cost considerably over $200 a car. Taking actual figures, it is found that the total cost of wooden sash in a coach, including maintenance, repairs and replacements, during a period of thirty years, will amount to somewhat over $1500.

In comparison with this, the brass sash now being introduced require little attention. They are oxidized by the atmosphere to a permanent and pleasing finish and do not need varnishing or painting. There is saved, therefore, the cost of removing the sash and replacing it in the car. The brass will not deteriorate like wooden sash, nor become loosened at the joints, and will not become swollen or warped, and do not bind in the window grooves. If brass sash ever become injured in an accident, they possess a very substantial scrap value.

Furthermore, with the brass frame, it is possible to make the rails very much narrower. With the same outside dimensions of sash, therefore, there can be obtained more light in the car. The larger glass also has the effect of adding very materially to the pleasing appearance of the car. If a larger glass is not desired, then correspondingly smaller outside dimensions of window can be used, permitting the use of wider posts between the window openings.



Forsyth Brass Sash with Rubber Bottom Weather Strip.

A perspective and cross sectional view of the bottom of a brass sash equipped with a combined weather and bottom cushion rubber member, is illustrated herewith. This sash is furnished by Forsyth Brothers Company, Chicago. As shown, the upper portion of the rubber is encased in a channel retaining strip. The rubber and its strip are held by a dove-tail insertion in the groove in the lower edge of the sash. It is more difficult to obtain tight and dirt-excluding contact along the bottom of the sash and the window sill than between the sides of the sash and the window grooves. In the latter there are two side walls, around which it is necessary for the air and dust to pass before being able to enter the car, whereas in the former there is only one rear wall and the sill, being on an incline, invites the wind and dirt to shoot up in the car.

The bottom rubber cushion on this sash is provided on its under side with a concave surface, which automatically adapts the sash to any variations in the longitudinal alignment of the sill such as camber of the car, or where the sill is not at right angles to the post, as well as to variations in the incline of the sill.

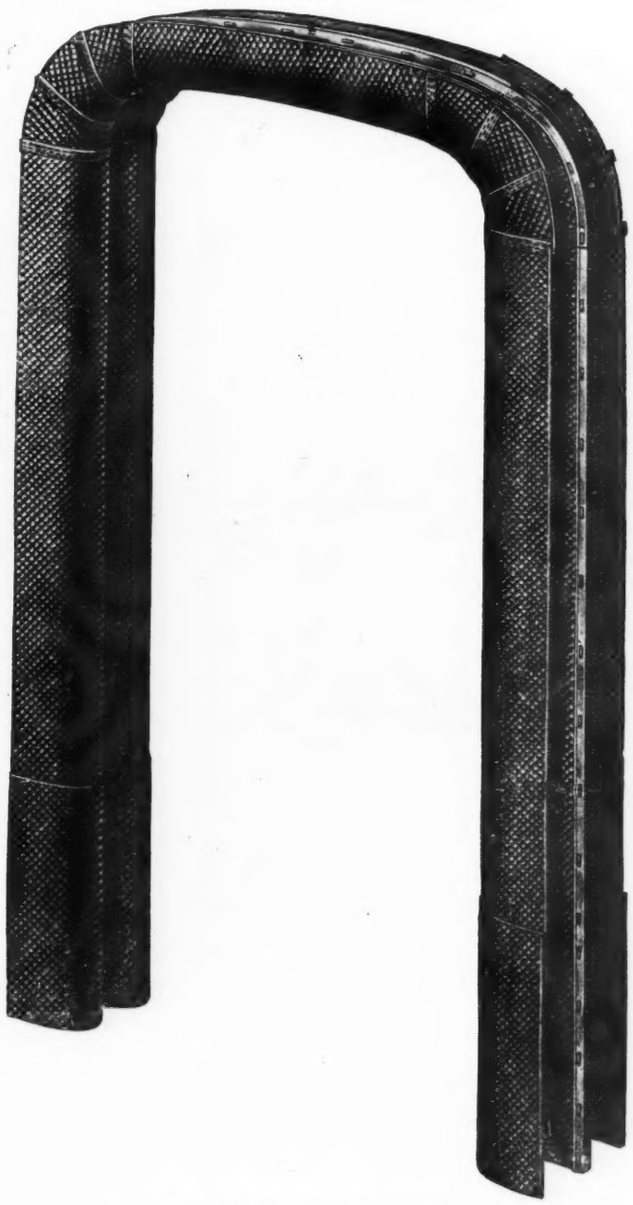
This cushion also breaks the jar of the sash when it is dropped or violently lowered, thereby greatly reducing the glass breakage.

This style of brass sash can be furnished in any shape desired. It is on exhibition at Booth No. 545.

ACME SECTIONAL DIAPHRAGM.

A car diaphragm that does not require a supplemental hood and is made in valleys of U-shape instead of the customary V-shape, thus having no sharp corners to catch cinders and retain moisture, is being made by the Acme Supply Company, Chicago.

The diaphragm is made of heavy three-ply cotton belting



Acme Sectional Diaphragm.

in three sections, one at the bottom of each leg, and the third making up the arch and upper part of the legs. A 20-in. expansion is provided with but two folds, which are bound together by a continuous brass binding around the outside. These two folds are secured by only a single row

of stitching and the real binding is accomplished by this brass channel, which caps over the edges of the belting. The legs of the channel are rounded out at the extremities so as to prevent any possible cutting at this point. It is securely fastened by large brass staples passing through both legs of the channel and the two pleats. These are bent over on the opposite side and securely anchored, and are located at 6-in. centers.

Instead of using a supplemental hood, this diaphragm is provided with a double thickness at the top. The top piece is made of fireproof and waterproof material, and the whole construction is practically self cleaning by the suction of air caused from the moving train. The boot is 24 in. high and extends 4 in. above the bottom of the leg portion of the diaphragm proper. It is placed inside the leg to provide lap and drainage, and has the warp of the belting running at right angles, thus adding greatly to its strength. It is not rigidly connected to the leg proper and does not have a tendency to draw up from the buffer plate at the inner folds.

This diaphragm is made in either the ordinary Pullman shape or the apex shape, the latter to be used when only one buffer spring is provided. It can be inspected in space 572.

MALLEABLE IRON HAND BRAKE FITTINGS.

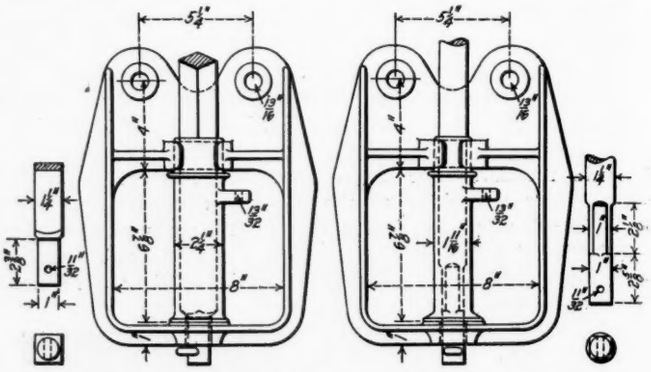
The National Malleable Castings Company, Cleveland, Ohio, has recently placed upon the market some new malleable iron brake fittings for both square and round brake shafts. The special feature of these new fittings is their adaptability to both the square and round brake shafts, which gives a more substantial arrangement than is obtained with

Square Brake Shaft with Malleable Fittings.

the ordinary brake shaft. In considering the advantages of the square brake shaft, the illustrations show the ratchet wheel fitting over the shaft without any pin or keyway to hold it in position. A retainer cast on the ratchet plate holds the ratchet wheel in place, preventing it from rising and thus disengaging the brake pawl. The ratchet wheel may be applied to the shaft at any point, and it is not necessary to machine or weaken the shaft in any way to apply it.

Fewer pieces are necessary with this installation than with the round shaft, and as the wheel bears on the ratchet plate, there is no weight on the brake shaft itself. The brake chain winds on a sleeve that fits over the lower end of the shaft. This sleeve has a square fit on the shaft and turns with it. It is held in place on the brake shaft step by malleable iron lugs which are bent around the upper end of the sleeve after it is put in place. The line drawing shows the work necessary on the end of the brake shaft.

In the case of the round shaft, the ratchet wheel is attached as usual by means of a small key; but a separate



Square and Round Shafts with Malleable Iron Winding Sleeve.

winding sleeve is placed on the end of the shaft as in the case of the square shaft. With this shaft more work is necessary as the end of the shaft is squared, as shown in the illustration, to receive the winding sleeve. However, the principle of reducing the weight and wear of the shaft is the same in both cases. Material used for the round shaft may be taken from any ordinary round iron,, such as old truss rod material, and there is no necessity of keeping any special stock on hand. By using the winding sleeve on the bottom, the strength of a 1¼-in. round shaft is greater than the regular 1½-in. shaft with 9-16-in. hole for the brake chain attachment.

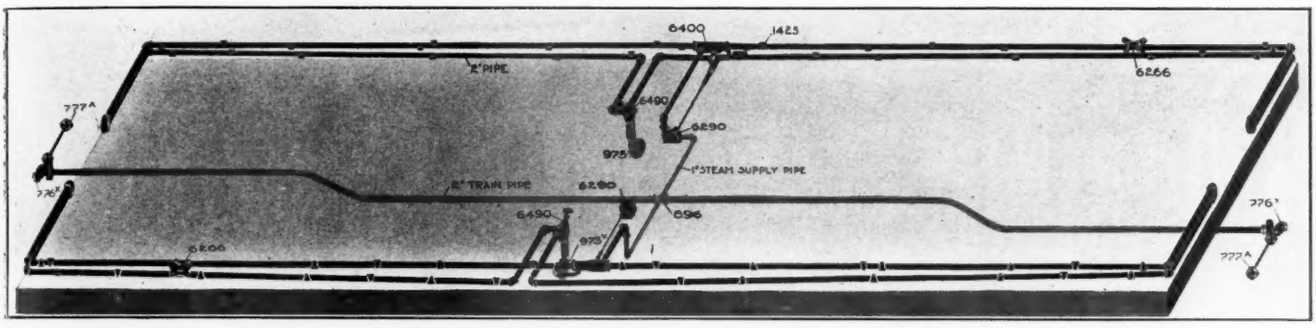
THERMO JET CAR HEATING SYSTEM.

Several new features of the Thermo jet car heating system are shown in the exhibit of the Safety Car Heating & Lighting Company, New York. The claims made for this system are that it saves 40 per cent. in steam and fuel consumption; that it gives a sufficient range of temperature to ensure comfortable car heating with any outside weather conditions; that it saves in the amount of pipe necessary for radiation; and that it reduces the amount of attention necessary to a minimum. In our climate, with its varying changes, a car heating system should be arranged to give a large variation in the amount of heat radiated in the car, and in order to get a range of temperature sufficient for proper car heating, it is necessary to have radiator temperatures varying from 132 deg. to 280 deg. F. It is claimed that the Thermo Jet system gives this large range of radiator temperatures, and that any desired car temperature can be maintained constant, regardless of what the outside weather conditions may be.

The principle of operation is simple; the temperature of the radiators is controlled by the expansion of a portion of the radiator pipe which regulates the amount of steam injected into the radiating system. A valve is connected at a certain point in the system so that as the temperature of the pipe rises sufficiently to expand the pipe, the valve is closed. When the pipe cools by radiation, the valve again opens and steam passes through an injector, and the cycle is repeated maintaining any

predetermined temperature of the car. Iron pipe expands and contracts according to a fixed law, so much per foot per degree, and it is a simple calculation to establish the proper length of pipe for a good valve opening to obtain a desired temperature of radiating surface. The valve opening can be set to any desired point by a simple arrangement with an indicator located at an available point in the car. If the system is set for a low temperature the valve opening is small and enough steam is mixed with the air in the system to give the required temperature.

An admirable modification of this Thermo Jet system is now available for compartment cars, whereby the temperature of each compartment may be regulated by the occupant of the compartment to suit his own particular requirements. This feature should eliminate the objection sometimes raised that the attendant or porter in a compartment car cannot regulate the heating system to give a temperature satisfactory to the occupant of each compartment, owing to the varying requirements of different people.



General Arrangement of Thermo Jet Car Heating System.

STEEL PASSENGER CAR SIDE FRAMING.

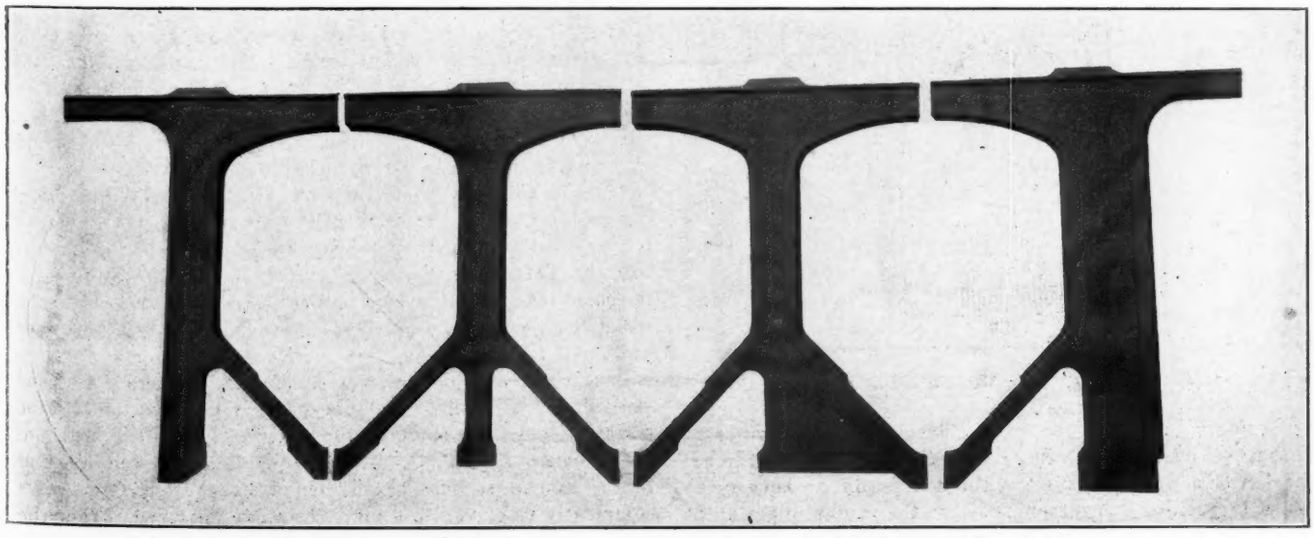
The details of the pressed steel unit panel side truss used on the New York, Westchester & Boston all-steel passenger cars, which were described in the weekly edition of the RAILWAY AGE GAZETTE, of June 14th, are illustrated herewith. Each of these units includes a main post, the diagonal braces, the letter board and the side plate channel. By making these members from one sheet of steel the riveted joints between the parts are eliminated. These unit panels are securely riveted together and form a continuous truss, the depth of which is such as to make the side frame of exceptional strength and rigidity. The panels are pressed from ¼ in. sheet steel, and are riveted together at the top with splice plates, and are butt welded by the oxy-acetylene process. At the bottom they are riveted to the side sill.

This construction is much better adapted to the full utilization of the properties of steel than that of the prevailing designs of wooden passenger cars. For example, a heavy steel belt-rail at the window sills is practically in the neutral axis of the side of the car, if the roof and the letter board be assumed as the compression member, and the side sill as the tension member of the structure. If, however, the belt-rail is assumed as the compression member then the letter board and roof are subject to an appreciable distortion, when the structure is under full load. The elasticity of a wooden structure permits of a considerable deflection without serious damage, but in steel cars the results will be serious if appreciable deflection is permitted.

In the ordinary steel passenger car the load is carried by side girders below the windows. They have an affective depth of approximately three feet. In the side-truss car the effective depth of the girder is about seven feet. The belt-rail in the side truss car is near the neutral axis and consequently only a light sash rest is required. To illustrate one of the advantages of the side-truss, it may be assumed that the side frame is required to resist a moment at the center of 2,000,000 inch pounds; then comparing girders of the heights given above, we have:

Stress on top and bottom members, three feet girder	55,600 lbs.
Stress on top and bottom members, seven feet girder	23,800 lbs.

Thus, it is evident that in addition to the elimination of the weight of the belt-rail, less than one-half as great

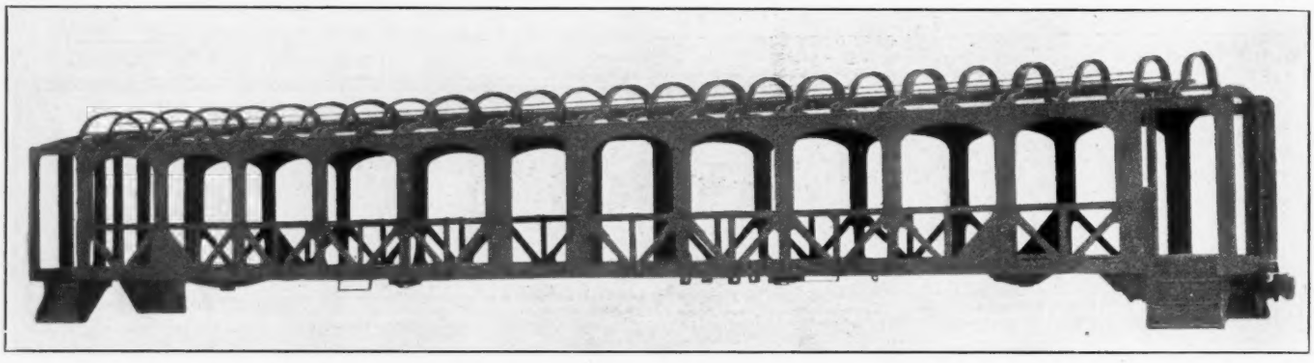


Pressed Steel Side Frame Units of New York, Westchester & Boston All-Steel Cars.

sectional area is required in the side sill of a seven foot girder as in that of a three foot girder for equal fiber stress.

The above example does not take deflection into account. For the purpose of comparison, it may be assumed that the cross-sectional area of the belt-rail and side sill in the three foot girder is 4 sq. in. each, and that in the seven foot girder it is half that, or 2 sq. in. each. Then the deflection of the three foot girder is nearly three times that of the seven foot girder. In actual practice this ratio may be slightly less due to flexure of the posts of the side-truss. However, with the side-truss construction no attention need be given to deflection, whereas in the ordinary type of construction deflection is often the determining factor. The side-truss construction is designed solely for fiber stress, and when thus designed no measurable deflection will take place even under full load.

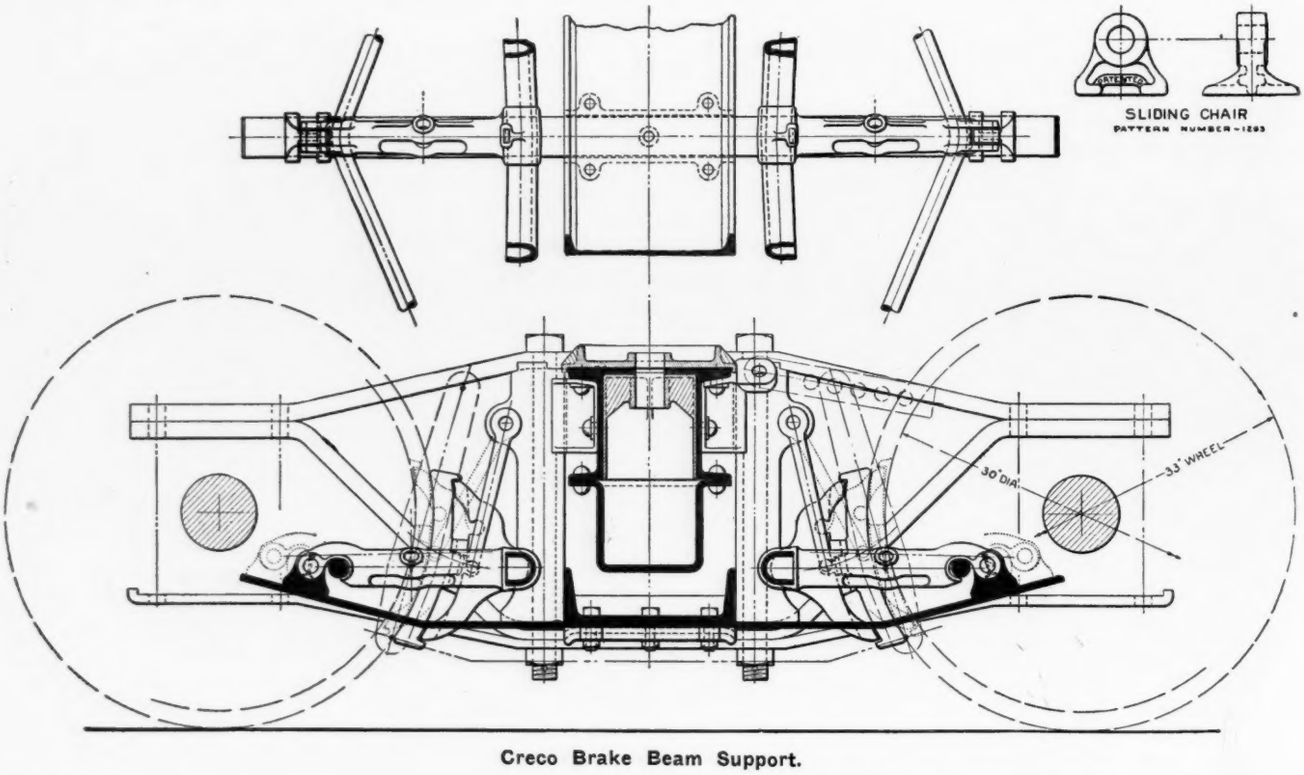
Finally, the side-truss construction saves nearly all the weight of the belt-rail, and approximately one-half the weight of the side sill, when designed for fiber stress alone, and for equal deflection it saves much more, because of weight that must be added to the shallow girder to bring the deflection within the limit. A further saving in weight is effected by the uniform section and center sill construction. The pressed unit side frame material was furnished by Forsyth Brothers Company, of Chicago.



Framing of New York, Westchester & Boston All-Steel Passenger Cars.

CRECO BRAKE BEAM SUPPORT.

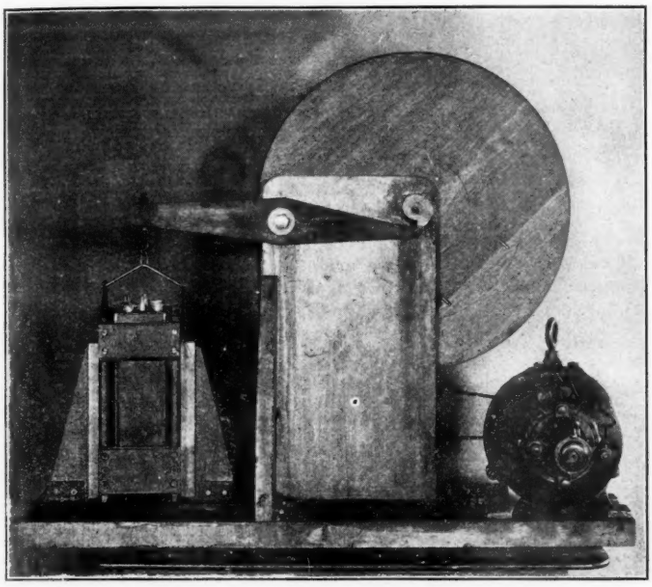
The Creco sliding third point brake beam support and safety device, made by the Chicago Railway Equipment Company, Chicago, is here illustrated. The makers call attention to the fact that this is the only device which provides for the conditions arising from the reduction in diameter of the rolled steel wheels. It has proved in service to add to brake beam safety, and the device maintains a proper relation to the brake beam hangers at all times, and is operative for beams of different strut depths on the same truck. The Creco support prevents the beam from tilting downward and does not pull against the forward movement of the beam when brakes are applied with worn shoes. It does not tie the beam to the flat spring support, and so does not prevent the beam from having such lateral movement as the brake hangers allow. It cannot throw the beam downward in case the underhung spring is bent, and cannot twist it out of place. It does away with the use of the second spring and cotter heretofore used, and permits of cheap and simple spring construction. It has the desired flexibility and broad bearing areas desirable in a device of this kind.



Creco Brake Beam Support.

SEVERE TESTS FOR STORAGE BATTERIES.

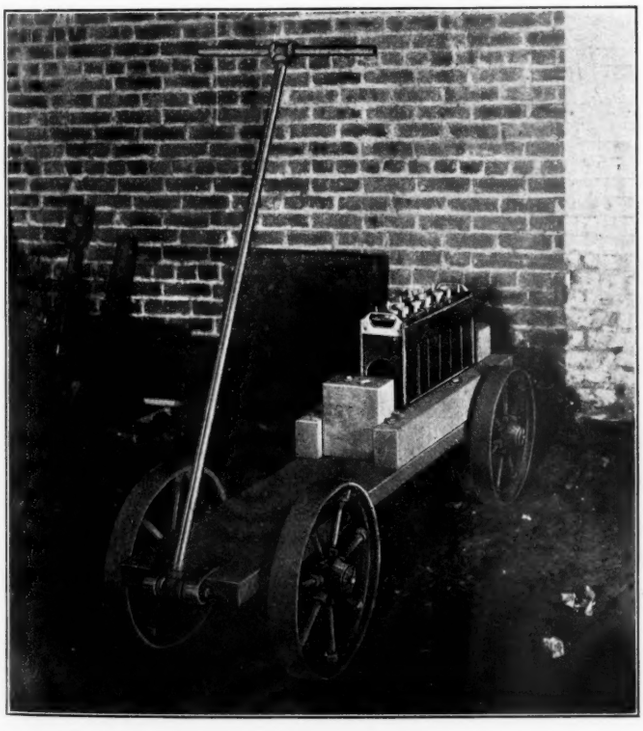
When the Edison storage batteries, which are specially fitted for train lighting because of their compact size, light weight, high efficiency and durability, were developed, Mr.



Machine on Which Edison Storage Batteries Were Tested.

Edison insisted that before they were placed on the market they pass successfully the following tests:

One of the batteries was selected at random from a lot of several hundred and was placed in a cage suspended



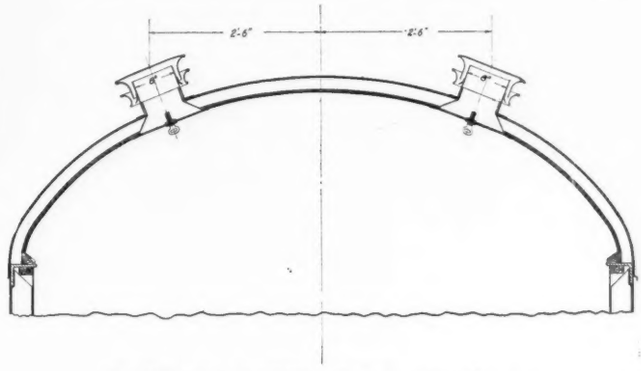
Truck With Edison Storage Batteries Was Projected Against a Brick Wall 500 Times at a Speed of 14 Miles Per Hour.

from a wooden beam, as shown in one of the illustrations. The beam was fulcrumed near its center and the other end bore against the cam attached on the same shaft as the large wheel, which was driven by an electric motor. As the cam rotated the storage battery was alternately raised ½ in. and then dropped on the solid oak base of the apparatus. After the cell had been raised and dropped 1,776,000 times it was tested and showed the same electrical capacity as it had before the test was made.

In another case six of the cells, mounted in a tray, were placed on a truck, which is also illustrated. Special means were provided for projecting this truck against a substantial brick wall 500 times at a speed of 15 miles per hour at the moment of impact, and the batteries were finally perfected to a point where they could stand this violent treatment without suffering injury.

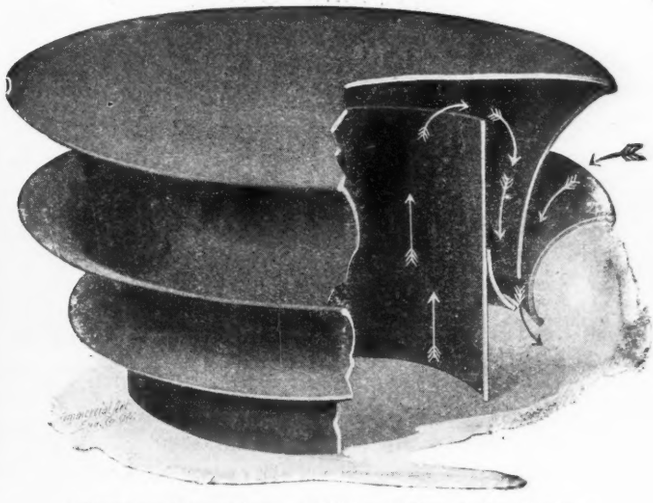
UTILITY EXHAUST VENTILATOR.

The Utility exhaust ventilators shown in the accompanying illustrations are very effective in removing the foul air from a car. The motion of the train causes air to be forced downward between the outer ring and the ventilator body, and this jet action draws air from the interior of the car.



Application of Utility Exhaust Ventilator.

Even when the car is standing still the wind acting on it causes good ventilation. There is no chance for cinders to lodge in the ventilator or between it and the roof and cause the metal to rust out. The ventilator is strong, being made of cold rolled steel, heavily galvanized. The accom-



Showing Operation of Utility Exhaust Ventilator.

panying drawing shows the method of application of about 2,000 Utility ventilators to the new steel cars being built by the American Car & Foundry Company for the Illinois Central. The ventilators are made in all sizes and special lamp jacks for oil and gas lamps are interchangeable with older types. For this service they are most desirable, as

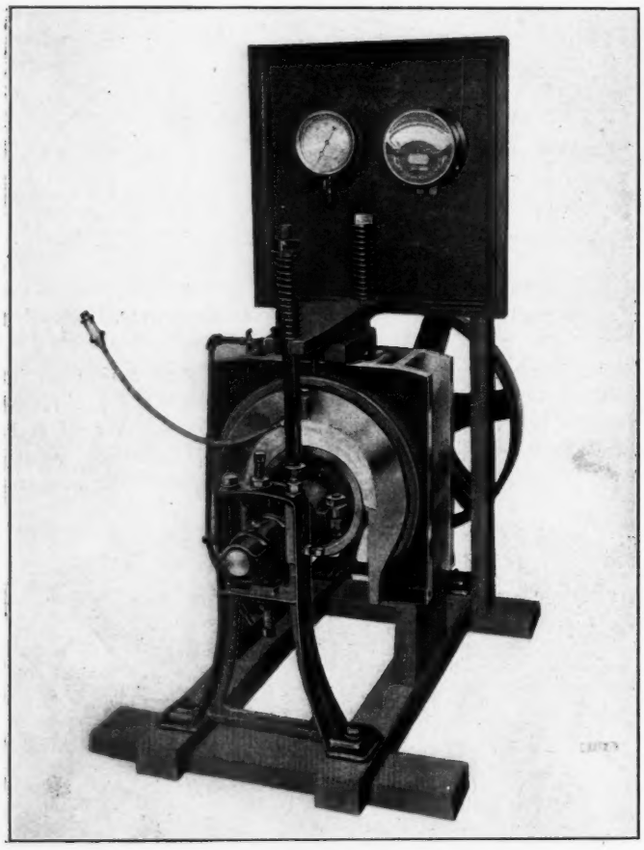
they keep out cinders and carry away the heat rapidly. This ventilator is made by the Railway Utility Company, Chicago.

MACHINE FOR TESTING JOURNAL FRICTION.

A machine for testing the amount of friction between the driving axle of a locomotive and its journal bearing as shown in the exhibit of McCord & Company, Chicago. It consists of a reproduction of a locomotive driving journal actuated by an electric motor connected in series with an ammeter, which indicates the amount of current consumed by the motor in overcoming the friction.

The journal bearing is fitted for the attachment of a McCord locomotive force feed lubricator and a gage is connected to the lubricator, which indicates the pressure on the oil between the axle and the journal brass. An adjustment is provided by which any desired load may be applied to correspond to the weight of a locomotive, supported by one driving journal.

In operation a valve is opened which allows enough oil to flow from the oil chamber in the journal bearing into the pan



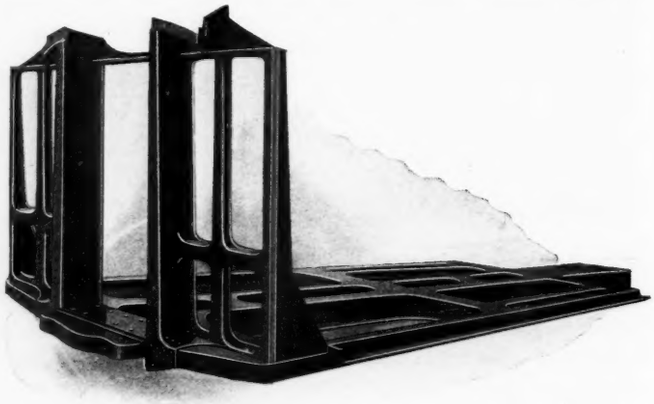
Machine for Testing Journal Friction.

under the machine, reducing the oil pressure to zero on the gage or to the condition of lubrication furnished by any system which relies upon packing a journal box with waste or upon a gravity feed. In other words, the only oil between the bearing surfaces is retained by adhesion and becomes less and less the longer the axle is rotated. The surface of the steel axle is now separated from the journal brass by a very thin film of oil and the reading on the ammeter indicates the amount of current ne e sary o overcome the friction.

When the relief cock is closed the oil is forced in by the lubricator to any pressure desired within the limits of the machine. The greater the pressure on the oil, the greater is the thickness of the film of oil which lifts the journal brass off of the axle. The greater the pressure of oil the lower will be the reading on the ammeter, indicating a smaller amount of current necessary to overcome the friction between the axle and the brass. When sufficient oil is pumped in so that the brass and the steel do not touch, but each bears on the film of oil, the reduction in current used by the motor is so great as to give conclusive proof of the value of the McCord locomotive force feed lubricator.

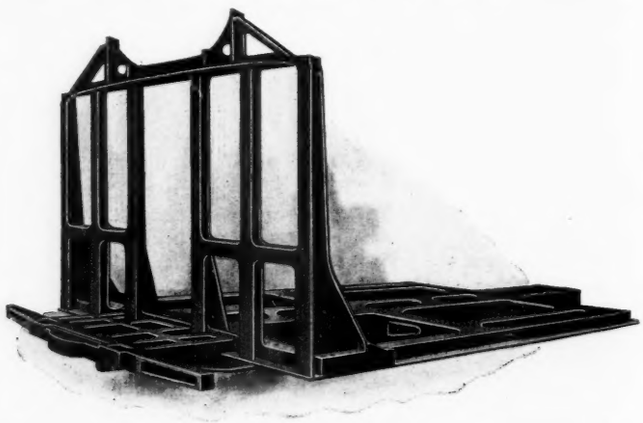
CAST STEEL END FRAMES FOR PASSENGER CARS.

Experience with steel passenger cars in collision where telescoping takes place has shown that the vulnerable part is in the end frame. This fact is recognized in the new specification for mail cars which has been adopted by the Federal authorities. To provide a strong structure at this part of the car, the Commonwealth Steel Company, St. Louis, Mo., has



Commonwealth Cast Steel End Frame for Passenger Car Without Platform.

designed two forms of cast steel end frames, one for passenger cars with platforms, and one for cars without platforms. These end frames are massive steel castings which are intended to be riveted to the Commonwealth cast steel double body bolster, and to the combined platform when required. In this way a strong construction in the end frame is added to that already provided in the cast steel end for the underframe.



Commonwealth Cast Steel End Frame for Passenger Car with Platform.

The connection of these two large castings is made with square abutting shoulders, which provide enormous resistance to shear, so that little dependence need be placed on the rivet section. The end frame casting is designed with proper proportions and economic sections with regard to the relation of strength, stiffness and weight.